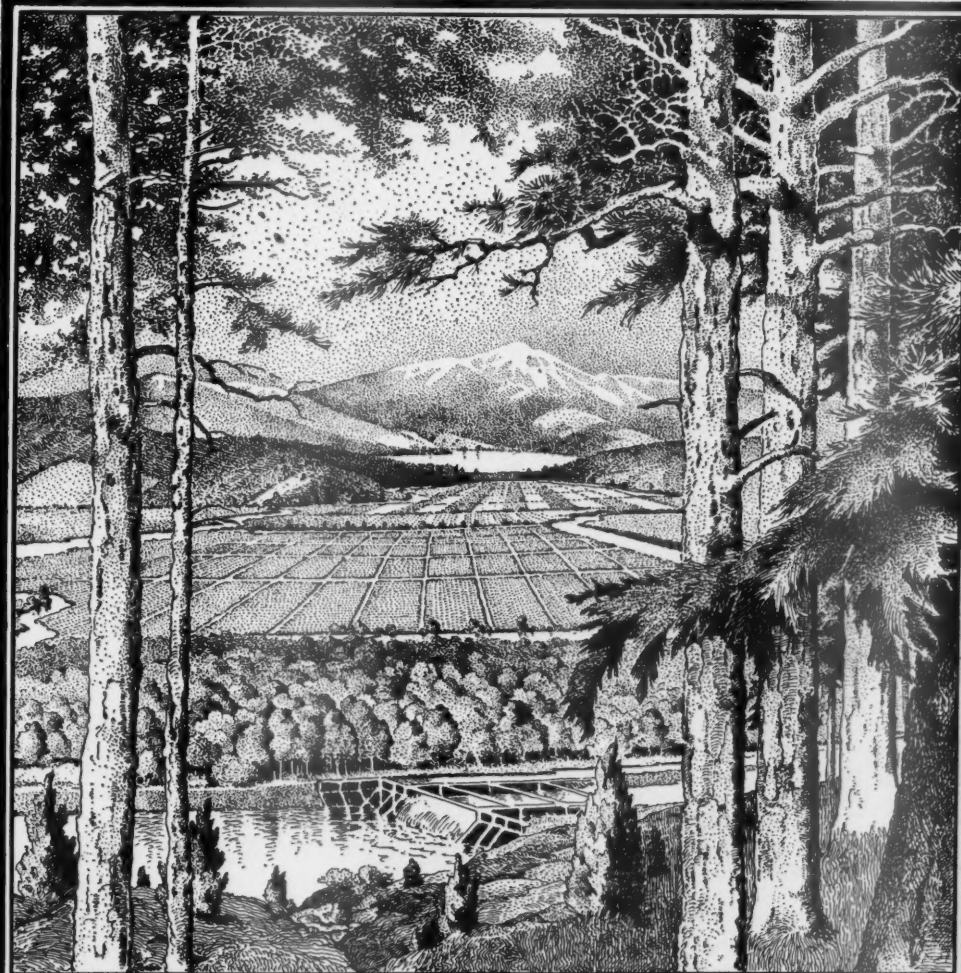


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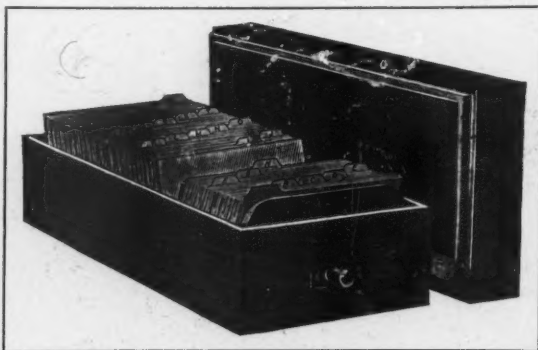
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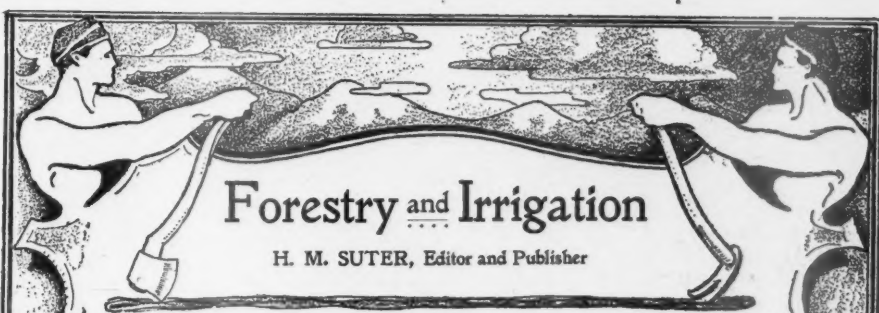
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Forestry and Irrigation

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THE THREE SISTERS, FROM FISH LAKE, CASCADE FOREST RESERVE, OREGON. THE TIMBER IS ALPINE FIR AND BULL PINE.

Forestry and Irrigation.

VOL. IX.

JANUARY, 1903.

No. 1.

NEWS AND NOTES.

New Forest Reserves. The Absaroka Forest Reserve, located in the southern part of Montana, in Park, Sweetgrass, and Carbon counties, is the latest set aside by presidential proclamation. It covers an area of 1,311,600 acres, and a portion of it bounds the Yellowstone National Park on the north.

Several reserves have recently been created in the Hawaiian Islands. In the island of Hawaii five scattered reserves contain a total of 226,478 acres. Three reserves in the island of Maui contain 33,379 acres.

Mr. Pinchot Returns. Gifford Pinchot, Forester of the U. S. Department of Agriculture, who started last August on a tour of inspection of the forests of the Philippine Islands, a commission undertaken at the personal request of President Roosevelt, returned to Washington January 8. He made the journey by way of Europe, which allowed him an opportunity of stopping at St. Petersburg, where he was able to see something of the forest work being carried on by the Russian government. He found the officials most courteous, the head of the forest service, Mr. Nikitine, assigning an inspector of high rank to show him the forest work in the vicinity of St. Petersburg. The Russian publications on forestry rather surprised Mr. Pinchot by their number and importance.

Near St. Petersburg is the Russian Government Forest School, where more than 500 students are taking a four years' course. Although the school buildings were being remodeled at the time Mr. Pinchot visited it, he was still

able to see something of the character of the school and to gather from the work done an explanation of the excellent system under which the Russian Government forests are managed. He also had an opportunity to see the system in vogue in northern Russia at the government forest at Licino, near St. Petersburg.

At Moscow, the next place visited, the Director of the Forest School, Professor Nederhoff, was well known to Mr. Pinchot, as they had met before at the French forest school at Nancy. Professor Nederhoff had also visited the United States. From Moscow he went south, into Little Russia, mainly in order to examine the tree planting on the open steppes, to which the Russian Government has given great attention.

In the trip across Siberia on the line of the newly opened Trans-Siberian Railway, the western part of that great area was found to be open, flat, and often swampy, with only scattered clumps of Aspen or Birch. Further east, on higher ground, there were vast areas of Scotch Pine (the most important tree), Birch, and Spruce. While the stand of timber is nowhere exceedingly heavy, as an American would understand the term, there is, nevertheless, a vast amount of timber in the country. Crossing into Manchuria, and going through the northern and southern provinces, the country is flat, and the latter region was found to be more completely cultivated than any other section. Plains and mountains here are bare of trees, the only timber being about the villages and near the little collections of graves which dot the landscape everywhere.

From Port Arthur, the termination of

one branch of the railway, Mr. Pinchot continued his trip to the Philippines by way of Chefoo, Shanghai, and Hongkong and returned via Japan, Hawaii, and San Francisco.

A Notice to Settlers.

The Commissioner of the Land Office, U. S. Department of the Interior, has issued a circular warning persons who intend to make homestead entries on lands temporarily withdrawn for irrigation purposes, of certain conditions which must apply under the provisions of the law authorizing such withdrawal. Naturally there has been a desire to make homestead entries on land thus temporarily set aside for irrigation surveys, as it appeared probable that the land would some day come under irrigation. In the circular issued, however, it is stated that "the withdrawal of these lands is principally for the purpose of making surveys and irrigation investigations in order to determine the feasibility of the plans of irrigation and reclamation proposed; only a portion of these lands will be irrigated even if the project is feasible; it will be impossible to decide in advance of careful examination what lands may be watered, if any; the mere fact that surveys are in progress is no indication whatever that the works will be built, and the Land Office cannot determine how much water there may be available, or what lands can be covered, or whether the cost will be too great to justify the undertaking until the surveys and the irrigation investigations have been completed."

Also, under the provisions of the law, should a homestead entry embrace land that is needed in whole or in part for a dam site, a reservoir, or a canal, the land would be taken for such purpose, and the entryman would have no claim against the United States for the taking of such right of way.

To Control Forest Fires.

In a special report to Governor Murphy, the State Geological Survey of New Jersey recommends that the legislature be asked to appropriate \$10,500 for the suppression of forest fires in New

Jersey, the money to be distributed as follows: Head forester, \$2,000 a year; 20 first-class wardens, \$60 a year each; 100 second-class wardens, \$25 a year each; traveling expenses, \$1,000; contingent fire fund, \$1,200; general contingent fund, \$500; clerical help, \$600; clearing brush in coöperation with the townships, \$1,000; general equipment, \$500.

It is pointed out that New Jersey has 1,400,000 acres of timber land to be protected, and the Survey expresses the opinion that under the conditions the expense would be very light.

The report says that the tracts burned over now in many instances are producing only one-third of the volume of wood which would be produced if they had been protected from fire, and only one-sixth of what the soil is capable of yielding under careful management. It is apparent, the report declares, that the forest as a whole is slowly being wiped out of existence.

During the present year, it is reported, the sixty-three forest fires destroyed 98,850 acres of timber land, and the damage to standing and cut timber is placed at \$168,323. It is declared that the legislation thus far enacted for the prevention of forest fires is ineffective.

Irrigation in the East.

In this issue of FORESTRY AND IRRIGATION, in an article on the "Sociological Aspects of Irrigation," Guy Elliott Mitchell makes an interesting prediction as to the adoption of irrigation by the farmers of the eastern half of the country. A decided start has already been made in this direction. Raising rice by irrigation in Texas and Louisiana is proving quite profitable, while many fruit-growers and market gardeners in New Jersey and Massachusetts are equipping themselves with facilities for irrigating their more valuable crops when necessary. *The Southern Planter*, by the recent publication of a letter from a Virginian, has brought forth a number of valuable suggestions on the possibilities of irrigation in the Old Dominion. Several writers have given valuable personal experiences

pointing to the success which attended their efforts, even when these efforts were made in only an experimental fashion. All of them have told of the prejudices which they have had to overcome from those who hold fast to that which is tried and believe the old ways the best; many have had the open ridicule of neighbors who looked on the irrigation idea as a mental vagary.

The best use of irrigation in the east is as an offset to drouths, particularly at critical points of a crop's growth. Hamilton Yancey, of Rome, Ga., is an ardent believer in irrigation for this purpose as a result of his own experiences. He installed an irrigation plant last summer, with which he pumps water for about 400 acres of land from the Coosa River. Last summer was an unusually dry season, and on July 25 a field of corn planted in June was not over 4 to 8 inches high, was bleached white and apparently dying. For two days at that time the field was irrigated with water between the rows, some parts of the fields being flooded. The yield was 50 and 60 bushels to the acre from this single application of water, without which there would have been no crop. Similarly another field which had reached the early earing stage was about dying, but revived in from four to six hours after irrigation. A good crop of corn and a heavy yield of fodder were secured. Adjacent fields were harvested for fodder only, and the yield was poor. Mr. Yancey makes the following statement about his oat crop:

"I may add, for the first time in my planting experience and knowledge my full oat crop, after reaching a fine growth of straw, failed to make seed, from the absolute want of moisture. Had I been prepared to give one good irrigation to this field of oats in the early part of May last, the yield would have practically paid for the installation of my plant."

The experiences of a Virginia correspondent of *The Southern Planter* are well worth noting, and are as follows:

"For seven years I have practiced irrigation upon a very small scale, not as an experiment, but because I have found by experience that it was one of

the most interesting, satisfactory, and paying institutions within my reach. In 1895 I formed a garden on a meadow, through which ran a never-failing brook. It was a flat piece of land in the shape of a parallelogram, about 100 yards long from east to west and about 70 yards wide. The brook approaches it from the west, the fall being east. On the south side a ditch conducts the stream along the side of the garden, and a dike on the south and west sides protects it from high water in time of freshets. It is also ditched on the other two sides and thoroughly underdrained. The rows of vegetables run lengthways—from west to east—the direction of the fall, and the cultivation is mainly done by horses, the rows being about 100 yards long. When irrigation is needed, by a simple and inexpensive contrivance water is brought to the upper end, and run down the rows of the vegetables to which it is desirable to apply it until the ground is sufficiently soaked, when it is shut off, the surplus water escaping into the eastern ditch. The result has been a wealth of vegetation I have never seen elsewhere; and by this method I have succeeded in doing what I could never do before, namely, raise enormous crops of celery and late cabbage, and have English peas and spinach during the entire summer. Even last summer there were occasions when I resorted to irrigation with excellent results—when I planted celery, late beans, etc."

Cheaper Turpentine Production.

Turpentine operators will be furnished soon, by the Bureau of Forestry, with a circular of instructions and with personal assistance in installing the new cup and gutter system of turpentine, which has proved so successful. The experiments of the Bureau of Forestry, at Ocilla, Georgia, conducted by Dr. Charles H. Herty, have shown the great superiority of the cup and gutter system over the old method of boxing pines. Trees treated by the new system have yielded 23 per cent more turpentine than boxed trees. Moreover, only the higher grades of rosin were produced.



VIEW IN THE SAPPHIRE COUNTRY, NORTH CAROLINA, WITHIN THE AREA OF THE PROPOSED APPALACHIAN FOREST RESERVE.

The increased yield for the first year alone has been found sufficient to pay for the new equipment and to furnish a profit besides. An advantage for the timber owner to consider is that the cup and gutter system does away with the injurious box and thus lessens greatly the damage done to the trees.

The superiority of the new method of turpentineing is so evident that many operators who are acquainted with the Bureau's experiments are eager to adopt it. Several potteries for the manufacture of earthen cups have been established. In a short time the new system will probably be in general use throughout the turpentine belt.

To make the benefits of the new method directly available, the Bureau of Forestry, besides issuing a circular of instructions, offers, without cost, the assistance of Dr. Herty, who will personally direct in the field the installment of the new system.

This work is an extension of the system of coöperation by which owners of timberlands may receive gratis the expert help of the Bureau.

Work by Michigan Forest Commission.

The Michigan Forest Commission has recently planted a large number of cuttings of Carolina Poplar on lands belonging to the forest reserve, in the vicinity of Higgins Lake. Seeds of various species of pine have been sown, and also a variety of nuts. These experiments have been started on various kinds of soil, and the planted areas are being protected by fences. This work, which is one of the first attempts to reforest the pine plains, will be watched with much interest.

Forestry on Indian Reservations.

The Bureau of Forestry, to which is entrusted the preparation of working plans for the management of the national forest reserves, several state forest reserves, and the military timber reserves, has recently extended its work to cover the conservative handling of the timber on Indian reservations. The Secretary of the In-

terior has made a request to the Secretary of Agriculture for advice as to the cutting of timber upon the allotted lands of the Bad River and Lac Cœur d'Oreille Indian Reservations of northern Wisconsin, and the ceded lands of the Menomonee Reservation. The timber is to be cut and sold and the proceeds are to go to the Indians. The Bureau of Forestry will have charge of the cutting, and will see to it that the timber is taken out in such a way as to do the least harm to the forest and to insure a good reproduction.

Water-power Conditions in California.

The wonderful results which California has accomplished in the transmission of electricity to distances greater than anywhere else in the world, leads to an interest in its peculiar type of water-power possibilities which in part make this great electrical development possible. The secret of the efficiency of California powers lies in the excessive grades of the mountain streams rather than in an unusual volume of flow, the near proximity of the high Sierras to the populated valleys and their quick descent giving the streams unusual advantages in this regard. As the controlling factor in the planning for power plants is largely a question of minimum water supply, the Hydrographic Branch of the United States Geological Survey, in response to many requests for information concerning this particular point, is making a system of low-water measurements of all the principal streams in the state from Mt. Shasta south to San Bernardino Valley. The work is under the charge of J. B. Lippincott, resident hydrographer of the Geological Survey. On many of these streams continuous records have been kept on the trunk system at points where they issue from the mountains, but few accurate data have been available as to the flow on the higher portions of the stream and its tributaries where the grades are particularly steep.

The method pursued during the present season is to place one gaging party on the trunk stream at the regular gaging station where records have been kept,

and by means of an automatic register obtain a record of hourly flow at this point for a period of about a week. The lower hydrographer also travels up and down the trunk stream for distances of 10 to 15 miles, making measurements at numerous important points. At the same time a second gaging party is making a circuit of the upper portion of the basin at elevations of approximately 3,000 feet, gaging all the tributaries as well as the trunk streams at these upper stations. As a result of these observations, comparative volumes on each of the streams observed will be made available.

Another feature of work in southern California consists of making determinations of the underflow through the gravel beds which frequently occur in this locality. This is done by the electric method which has been invented by Prof. Charles S. Slichter, of the University of Wisconsin. Observations have been made at the Victor Narrows, the San Gabriel Narrows, and the narrows of the Los Angeles River, for the purpose of determining underflow.

Yale Forest School.

The members of the senior class at the Yale Forest School have lately returned from their required month of field-work in actual lumber camps and are now preparing their reports concerning the lumbering methods of the regions which they visited. The camps visited extend all the way from New Brunswick to Texas, so that conditions at these two extremes were studied, as well as at intermediate points in Maine, New Hampshire, the Adirondacks in New York, Pennsylvania, Michigan, North Carolina, Tennessee, Georgia, and Florida. The report which they are required to write must contain details covering the conduct of lumbering operations and the management of timber lands. The questions for their solution are very comprehensive, going so far as to include even culinary details and laundry supplies in the lumber camps. On the purely technical side of lumbering operations, for example, every item of scaling and its equipment must be noted, with full explanation.

THE FORESTS OF MAINE.

A REPORT ON THE TIMBER RESOURCES OF
THE STATE BY THE FOREST COMMISSIONER.

THE first official report of the forest commissioner of Maine issued since 1896 has been submitted to the legislature by Hon. Edgar E. Ring, the present incumbent of the office. This report contains an exhaustive description of the standing timber of the state, the outlook for future supplies, and the methods of lumbering; also a study of the forest fire problem. In his report Mr. Ring says:

"To obtain a reasonably accurate estimate of the standing timber, and particularly the merchantable spruce, for either pulp or saw-logs, throughout the state, was a task of no small magnitude. By merchantable timber I mean trees that are 9 inches in diameter breast high. Realizing that mere guesswork would be of little value to the timber-land or

mill owners of Maine, I employed expert scalers and explorers early in the season to aid in the work of securing reliable and authentic information concerning the location, quality, and the amount of standing timber ready for the woodman's axe or saw.

"The work was divided according to the state watersheds, more attention being paid to the four great river systems—the St. John, Penobscot, Kennebec, and Androscoggin—than to the minor systems near the coast.

"With the understanding that the estimates furnished were to be used in getting at an aggregate of the standing timber in the state and not separate townships, the owners of the land have invariably assisted in the search for information on the subject. To them

and to all others who have aided in this work I feel greatly indebted.

"The results of these explorations are very satisfactory and show that there are standing in the forests of Maine at this time 21,239,000,000 feet of spruce, besides large quantities of pine, cedar, hemlock, poplar and various species of hardwoods.

"From deductions made by Ralph S. Hosmer, a field assistant of the Bureau of Forestry, who has been making experiments in this state during the past summer, * * * it is learned that the annual growth is sufficient to warrant the cutting of 637,000,000 feet of spruce timber in the State of Maine each year without depleting the supply.

"It is clearly apparent, therefore, that the forests of the state are amply able, by careful cutting, to meet the needs and requirements of the pulp and saw mills for an indefinite period, unless devastating fires and ruinous wind storms occur to cause damage and injury to the timber now standing and in process of growth.

"The State of Maine is large in area, containing 31,500 square miles of territory. Of this area, 21,000 square miles is forest land. There are 9,471,050 acres taxed by the board of state assessors as wholly wild land, but this does not include all of the lumber-producing land of the state.

"It is also true that, in addition to the land in the old incorporated towns that is actually timber-producing at the present time, there are large areas once used for agricultural purposes that have been allowed to go back to woodlands. In many instances the second growth is small and of little or no value for manufacturing purposes at present, but each year a certain percentage becomes available, and in the course of a series of years a large amount of lumber will be supplied from this source.

"Very little land is being stripped to such an extent that it will not furnish another crop of lumber from the undersized trees of the present stand in a comparatively few years.

"Actual deforestation, except from forest fires, as I have stated, can never take place to any considerable extent in

Maine, as the agricultural lands are very largely occupied. On the other hand, there is likely to be a constant increase in our lumber-producing areas, on account of there being so little profit in cultivating dry, stony ground for farm crops, and more or less of such lands are reverting to forest growth each season. On the whole, it is safe to reckon that there will be from 11,000,000 to 12,000,000 acres of land in this state that will be lumber producing for all time.

"Very nearly all the lumber of Maine which has been used in the manufacture of pulp and paper has been taken from the drainage of the Androscoggin, Kennebec, and Penobscot rivers. The proportion has been 42 per cent from the Androscoggin, 33 per cent from the Kennebec, and 25 per cent from the Penobscot. Practically there has been none taken from the St. John's drainage or from the southeastern portion of the state in Washington and Hancock counties, both being largely wild land regions.

"The total acreage of these three systems, from which all the pulp lumber consumed in the state has been taken, is about 4,741,000 acres, leaving more than one-half of the entire wild land region from which no pulp wood of any consequence has ever been removed.

"The average rate of increase or annual growth of spruce in the state varies according to the character of the soil and whether the trees have been thinned so as to allow light and air to penetrate the forests, the actual percentage ranging from 2 to 4 per cent. If 3 per cent is taken as the average, which may be regarded as a conservative estimate, there should be an annual increase of about 637,000,000 feet.

"The pulp mills, as now established, consume about 275,000,000 feet of spruce a year, besides considerable poplar, pine, and hemlock, which are not considered in this calculation. This leaves for saw-mill purposes about 362,000,000 feet, if we cut the annual increase alone, with other conditions remaining the same as in the past; but with improved methods of cutting and managing wild lands, which are being carefully studied, I am

satisfied that the percentage of increase will gradually rise to at least 4 per cent, which would add materially to our annual supply without decreasing the actual stand of timber.

"While my efforts to obtain a fair and reliable estimate of the standing timber in the forests of the state have been mainly directed to the ascertainment of the amount of the spruce supply, I have not lost sight of the fact that there are other woods growing upon Maine soil which are of inestimable value to the land owner and to the manufacturer. In the Kennebec section large quantities of poplar, valuable in the production of the best grades of paper, are found. Sapling pine and even pine of older growth may still be found in many sections of the state. Other varieties of soft woods grow upon our hills and in our valleys and all must be considered in determining the total value of the forest resources of our state.

"Little is said or written of the White Birch growth in the state, but one has only to look into the matter a little to learn that upwards of 35,000,000 feet of White Birch timber are taken annually from our forests. The White Birch area is a wide belt that extends entirely across the state. White Birch is used largely by the hardwood novelty mills of the state, yet its greatest utilization is in the manufacture of spools. The spool factories of Maine annually produce about 800,000,000 spools, valued at more than \$1,000,000. Besides being used in the production of spools, much White Birch is cut into spool bars for shipment to Europe. Other hardwoods are used to a greater or less extent in the manufacture of small articles, but the consumption of White Birch leads the field in this particular line."

Commissioner Ring includes in his report descriptions of the fourteen river systems of the state, their territorial area, volume of water power, and other facts relative to their value as timber-producing sections. The extreme northern section of the state is included in the "St. John River system of Maine," which embraces the greater portion of Aroostook county and is the most prolific lumber territory in the state. This

section comprises 7,400 square miles, and in some parts of it there are great tracts of virgin spruce that have never known the woodsman's axe. Of this section Mr. Ring says:

"Careful estimates made during the past season, taking each town by itself, from recent explorations, show that there are standing today on the land in the townships which drain into the St. John River system in Maine 6,942,000,000 feet of spruce, 427,000,000 feet of pine, and 1,830,000,000 feet of cedar. This is exclusive of about 200,000,000 feet located on the headwaters of the Allagash which will be turned into the East Branch of the Penobscot by a company now operating on those waters."

In the Penobscot River system the timber now standing consists mainly of spruce, although the amount of cedar to be found in all parts is large. From the best estimates obtainable, Mr. Ring says that there are now standing 5,166,000,000 feet of spruce, 438,000,000 feet of cedar, and 153,000,000 feet of pine.

The Kennebec River system, according to the reports of the explorers who have been employed during the past season to ascertain as nearly as possible the amount of spruce in this section, has 3,883,000,000 feet now standing, ready and suitable for lumber or pulp.

In the Androscoggin River system, Mr. Ring states there are 3,248,000,000 feet of spruce ready for cutting.

Of the ten minor river systems in the state Commissioner Ring says:

"There are ten of these river systems, beginning at the New Brunswick border and extending along the southern coast of the state to the New Hampshire line, and though none of the systems are richly covered with timber, yet in the aggregate their timber resources are of much value and must be reckoned in the estimate of the amount now standing in the whole state.

"In the territory included in these systems there is a considerable amount of sapling pine, large quantities of which are being annually manufactured into box boards.

"At least 2,000,000,000 feet of spruce is available in the ten river systems outside the four large systems."



MR. C. B. BOOTHE,

A PROMINENT WORKER FOR NATIONAL IRRIGATION.

MR. BOOTHE'S connection with the national irrigation movement began with the fifth National Irrigation Congress, at Phoenix, Ariz., December, 1896, when he was chairman of the California delegation. He served as President of this Congress and also of the Congress held at Lincoln, Nebr., the following year. Upon the organization of The National Irrigation Association, the impelling force in the national irrigation movement, he was recognized as the logical leader for the southwest. Mr. Boothe organized and was made chairman of the executive committee of the southern California section of the Association, now numbering over 400 and composed of the leading merchants, bankers, manufacturers, and agriculturists of the southwest.

Since the beginning, Mr. Boothe has been prominently connected with successive steps of the project and has been in conference with the leaders on every question raised concerning national irrigation policy. He believes thoroughly that the national government should, as a business proposition, reclaim and make habitable the arid lands of the west, and that the distribution of these lands should be so guarded that they will be owned and controlled by actual settlers only.

Mr. Boothe was born at Stratford, Conn., July 3, 1851, received an academic education and later read law in New York, but went into the banking business. As a result of overwork, he was forced to take a water trip to California, and returning later went into mercantile and manufacturing pursuits until 1891, when a second trip to California was necessitated on account of failing health. In 1894 he established the pioneer machinery house in Los Angeles, introducing higher grades of machinery, especially in water-works plants, as he realized that economy of operation was a vital factor. Since January, 1901, Mr. Boothe has not been actively engaged in business.

RELATION OF FORESTRY TO THE PUBLIC HEALTH.

EXTRACTS FROM THE REPORT OF THE COMMITTEE
APPOINTED TO INVESTIGATE THE SUBJECT FOR
THE AMERICAN PUBLIC HEALTH ASSOCIATION.

BY

PROF. WILLIAM H. BREWER,

YALE UNIVERSITY, CHAIRMAN OF COMMITTEE.

IN this report the committee confines itself to forests and forestry in the countries represented by the Association, namely, Mexico, the United States, and Canada. This geographic region is so vast in extent, it includes such a variety of climate, soil, and topography, that the relations of forests and forestry to the public health are very unlike in different portions of it. Some of the questions involved are local and others general, but for our present purpose these several relations may be classified into two main divisions or classes, namely, the relations of forests to the health of communities as communities, and the relations of forests to the health of individuals as individuals.

A community dependent on a forested watershed for its water supply is an illustration of the first, and the people most concerned may be distant from the district on which the rains fall. In this case the forest benefit comes to the community specially benefited. An individual may visit a forest for recuperation or cure, or he may choose his dwelling near it for its more salubrious air, or a similar place be chosen as a site for hospitals and sanatoria for the same reasons; these are illustrations of the second, and in these cases the individual must go to the forest to be directly benefited by it.

The physical factors involved in the relation of forests to health are Forest Water, Forest Soil, Forest Air, and Forest Climate. These cannot be fully discussed as independent factors, because all are closely correlated and more or less interdependent, and, moreover, they all

work in combination in most of their hygienic relations.

Forest Water.—The chief relations of forests to water are, firstly, that forests conserve the rainfall. This is perhaps its most important relation to the public health in the countries here under consideration. Secondly, forest waters as a rule are purer than the waters of the open country.

Forest waters are purer than those from tilled lands. The dissolved impurities of natural water are derived from the decaying organic matter on or near the surface and from the solution of certain portions of mineral matter from the soil. It is obvious that the organic impurities would be more abundant in waters flowing from cultivated fields.

Forest waters are also as a rule clearer and cleaner. They contain less suspended matter which produce turbidity and also much less bacterial life. The hygienic importance of these characters is obvious.

Forests always and everywhere conserve the rainfall and regulate the flow of springs and streams better than the open country does. The practical applications of this fact will increase in hygienic importance with the increase in size of our cities and in the number of towns requiring a public supply of water.

Wet soils have in some places been made much drier and healthier by being planted with trees, especially with certain species of Eucalyptus. The kinds used are of rapid growth, and transpire so much water that the soils are made drier. It is, however, possible that with

trees of this genus the aromatic exhalations of the trees may be a factor in producing the hygienic results reported to have been achieved. Their planting and growth has reduced malaria in various parts of the world.

Forest soils differ from the soils of fields and treeless regions in several characters. There has been much investigation of this subject in the interest of both agriculture and forestry. For our present purpose, it is enough to say that forest soil, not being stirred except as is done by the roots of plants, it is not subject to that rapidity of chemical change that occurs in lands subjected to tillage by which fresh portions are successively brought to the immediate action of the air. Forest soils are very much poorer in bacterial life as to quantity, and unlike as to prevailing species.

Forest air has been much talked about and written about. That many invalids are improving by it there is no question; so are invalids often benefited by sea air and mountain air, which in many characteristics it resembles. That forest air is usually salubrious, and often even curative, is well known. Many thousands of chemical analyses have been made showing very particularly the relative properties of oxygen, carbonic acid, and ozone, and there have been numerous investigations on the amount of dust and bacteria. A sufficiently larger proportion of oxygen is not a special characteristic of forest air.

Of more interest is the relative amount of ozone. While the direct effect of this was greatly overrated a few years ago, it is sufficiently well established that ozone has often a curative value, and it is also abundantly proven that forest air has a larger average ozone content than the air over cultivated fields and towns. Indeed, the air of cities is always relatively poor in ozone, and within crowded dwellings it is usually entirely lacking.

There is a large amount of recorded observation on the relative amounts of ozone and its atmospheric distribution. The average is richer in forests than in regions distant from them, and richer on the edges and above the crown than

within the forest itself, particularly of a deciduous forest. It is, as a rule, more abundant in coniferous forests—pine, spruce, fir, balsam, cedar, and the like. This is doubtless due to the balsamic and terebinthine exhalations of many cone-bearing species.

It is eminently probable that ozone is a factor in the restful and sleep-promoting influence of forest air, so often observed by physicians in their practice and by laymen who visit the woods for rest and recuperation.

Then, too, ozone by its oxidizing power is a great destroyer of the gases produced by putrefactive decay and which are always unwholesome. While the direct therapeutic action of ozone was doubtless formerly overrated, it is eminently probable that by its indirect influence on curative processes it is very important as a factor increasing the salubrity of forest air.

The dust in the air constitutes a much more important ingredient. That forest air is cleaner than that of the city or country is evident to the senses. The dust from the streets and roads and from the fields and gardens, the dust produced by many operations in the industries, the smoke particles from the numerous chimneys, and the thousand and one other sources of dust make the local differences very striking, and they have been extensively studied. The amount and the unwholesomeness of this dust is intimately related to the density of the human population. The great harmful ingredients are decaying organic matter and the micro-organisms small enough to be raised by the wind, and especially the pathogenic bacteria.

I have for many years made a study of dust in its relations to various other atmospheric phenomena, and believe that its relative scarcity in forest air is the most important hygienic difference between that and city air.

We have already stated that forest soil and water are both very much poorer in bacteria than that from cultivated fields, and the forest surface is such that those which are produced are not easily liberated into the air. Moreover, the winds are never so high; therefore the bacteria that are wafted there

from outside sources fall sooner than they would if over the open country. The filtering action of the foliage is a factor in diminishing the suspended dust, as is easily seen on the dust-laden leaves in thickets by the roadside.

Forest climate somewhat resembles a sea climate in that it is a little purer as to gaseous impurities and is very much cleaner of dust, and is also of more uniform temperature. It differs widely from sea air in its milder winds and in those ingredients and odors which come from the trees themselves. Its gentler winds are probably its most important climatic character, as related to health, and the next in importance is its more uniform temperature.

Harsh and raw winds are tempered by trees, and so important is this and so well known that, in our own country, when a new open prairie is settled, trees are immediately planted to make a "wind break," for its protection to the health of the family as well as for the health and shelter of garden and orchard. The bleak winds of winter are less chilling and the hot winds of summer neither so dry nor so scorching. The differences in the temperatures of the soil are even more marked, and have been carefully studied by long series of observations made at the surface and at depths of one, two, three, and four feet. The ground does not freeze so deeply, the daily, monthly, and yearly range of temperatures are less, and changes are neither so sudden nor so great.

The hygienic aspects of these several characters are especially obvious in their effects on the young and feeble, the invalid and the aged. The combination of special characteristics of the soil, water, air, and climate furnish a philosophical reason for the location of sanatoria and hospitals in forests or on their edges.

The psychological influences of forests are especially beneficial to very many persons. This is probably a relatively new hygienic factor, due to the absorbing sentimental love of nature which, to the present generation, endows forests with such a charm.

The subject of shade trees needs mention here only to say that their influence

is in many ways healthful, psychologically and physically; also that they may be too abundant near the immediate dwelling, in that they increase dampness, especially in certain climates, and many too much obstruct the sunlight. I have known several families to suffer from consumption where, I have no doubt whatever, the disease was invited and intensified by the dense shade of the beautiful and beloved trees about the old home. In this matter the choice of species of trees to use has been too little considered from the hygienic point of view.

Quinine is a notable illustration of the medicinal products of forests and their relations to forestry. When the natural cinchona supply became scarce in South America, the European governments having tropical colonies, especially the English in India and the Dutch in Java, began its cultivation, founding its artificial production on careful scientific investigations. You know the result. Cultivated plantations now supply most of the quinine of commerce. Now that this country has extended its possessions into the tropics, this may yet become a live question with us. There are other forest medicinal products of our American trees and shrubs, some of wide popular use, of which the Witch Hazel is a familiar example. Whether the cultivation of trees for this use will ever be of much importance in this country and Canada cannot now be stated; it is, however, worth mentioning, and in Mexico will undoubtedly become an important matter.

In conclusion, we may say that the "Relations of Forestry to the Public Health" on this continent are so many and so great that boards of health should give their official attention to the matter whenever practicable, and in such ways as the local conditions suggest. Several of the state boards have already taken an active part in the promotion of forestry and in the protection and salvation of existing forests, but most of them have done nothing officially in this line, although many of the individual members of state and provincial boards have unofficially done much as individuals and as public-spirited citizens. But we believe that the American Public Health

Association can be a powerful factor in advancing the good work by taking an active interest in the general subject, educating the public as to its hygienic importance, aiding in the establishment of forest reservations under public management—municipal, state, and national—and urging that the practical management of our public parks and

forests be by experts, educated in the science and trained in the art of forestry. We would recommend the public ownership of such lands as are worth more for public forests than for agriculture, to be administered as a branch of the public service in the interest of the public health, as well as for the economic welfare of the people.

THE ASSIUT BARRAGE.

SUPPLEMENTING THE NILE RESERVOIR DAM AT ASSUÂN
AND PART OF THE SAME GREAT SYSTEM OF IRRIGATION.

BY

THOMAS H. MEANS,

IN CHARGE OF U. S. SOILS SURVEYS, DEPARTMENT OF AGRICULTURE.

THE Assiut barrage is supplementary to the Nile dam at Assuân, and was planned at the same time. Contracts for both pieces of engineering were signed by John Aird and Company and construction was commenced at nearly the same date in the two places.

Assiut is situated 235 miles south of Cairo, and 320 miles below the great dam at Assuân. The river at this point has a width of about 2,700 feet, and a range in level of water surface between high and low Nile of about 30 feet.

The barrage at Assiut is intended to raise the level of water in the Nile, during the season of low water, sufficiently to enable land lying along the Ibrahim-yeh canal to be irrigated throughout the year. In 1898 there were 500,000 acres of land under "perennial" irrigation (that is, irrigated throughout the year), watered by this canal, besides a large amount of "basin" land. By "basin" land is meant land irrigated by the method which has been in use in Egypt for over 7,000 years, which method consists simply of flooding large areas enclosed by high earthen dikes and, after draining away the water, planting the crops in the newly deposited mud. By this basin system of irrigation, but one crop can be produced each year, but when the land is perennially irrigated,

always two, and sometimes three crops are produced.

The construction of the Assiut barrage permits the conversion of at least 300,000 acres of land, from basin to perennially irrigated land, renders certain the irrigation of the 500,000 acres already under perennial irrigation, and insures the filling of the basins not yet converted to perennial irrigation, thereby preventing the loss of money through having "sharaki," or dry land, producing no crops.

Work on the Assiut barrage was commenced in June, 1898, and the first masonry was laid in December of the same year. In June, 1902, the work was completed, though a large amount of rock-pitching has been placed below the barrage since that time, and this will be continued for a year or more until a thoroughly stable structure exists. The cost of the completed dam was about \$4,250,000.

The barrage is an open weir, with 111 gates, each 16.4 feet wide, with piers 6.6 feet thick between. Every ninth pier is 13.1 feet thick. Each gate is in two parts, each 8.2 feet high, working in separate grooves, permitting the raising or lowering of either the upper or lower portion independently. The gates are capable of holding up 8.2 feet of water.

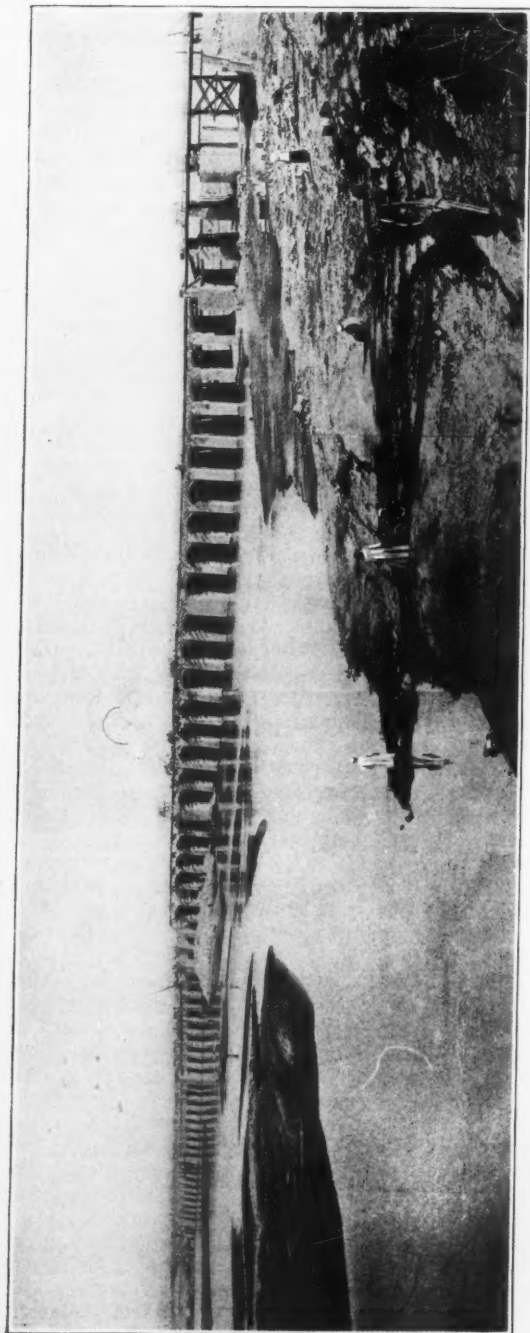


Photo from Egyptian Public Works Report, 1920.

ASSIUT BARRAGE IN COURSE OF CONSTRUCTION, LOW NILE.

The foundation of the dam is laid on the sands and clays of the river bed. The foundation consists of a masonry and concrete flooring 86.9 feet wide and 9.8 feet thick. Along the upper and lower edges of the flooring sheet piling is driven to a depth of 13.1 feet below the bottom of the masonry. On the upstream side clay puddle, covered with a layer of broken rock, extends to a distance of 65.6 feet; on the downstream side, stone-pitching extends to a distance of 98.4 feet, or 49.2 feet beyond the end of the masonry flooring. Pitching is being continually added to this downstream apron in order to insure the perfect stability of the dam under the strain of heavy floods.

Upon the concrete and masonry flooring, the barrage, consisting of openings and piers as described above, has been constructed. The original intention was to make the superstructure of brick, but the clay at hand was not well suited to brick-making, and stone was used instead. The piers are spanned by arches carrying a roadway 14.7 feet wide, on which narrow-gauge tracks are laid. Gates are raised and lowered by hand winches running on a track elevated about a meter above the roadway. The gates are suspended on chains and are held in place by notched steel plates resting across short iron girders.

Around the west end of the dam is a ship canal and lock capable of carrying the largest Nile boats.



Photo from Bureau of Soils, U. S. Department of Agriculture.

VIEW THROUGH THE SLUICES SHOWING GATES RAISED ON THE RIGHT.



Photo from Bureau of Soils, U. S. Department of Agriculture.

ROCK-PITCHING BY HAND FROM THE BARRAGE AND FROM THE BOAT BELOW.



Photo by Thos. H. Means.

FLEET OF NILE BOATS, JUST THROUGH THE BARRAGE SHIP CANAL.

The construction of this lock and canal cost a large sum, which makes the total cost of the barrage higher than a similar structure would be on our western rivers where there is no commerce. The cost of headworks, regulating bridge, and navigation canal at the head of the Ibrahimiyeh canal are also included in the cost of the barrage.

The heavy floods in the Nile were a great source of inconvenience and difficulty in the construction of the barrage. The flow of the river at Assiut varies from 10,000 cubic feet per second to

500,000 cubic feet, causing a variation of over 30 feet in the level of the water in the river. The method of work consisted of building an earthen dam around a portion of the river bed as the flood subsided and laying the foundation of this portion of the barrage. Then the dam was removed and a new portion of the bed inclosed. Thus the greater part of the work was done during the season of low water, between December and August. From 7,000 to 8,000 men were employed, and during a portion of the time as many as 12,000.



Photo by Thos. H. Means.

ROCK-PITCHING FROM THE BARRAGE.

The original intention was to use the barrage for the first time during the low water of 1903. However, the Nile flood of 1902 was exceptionally low, one of the lowest four of the century, and a great area of land stood in danger of being dry throughout part of the next year. Mr. A. L. Webb, Inspector General of Irrigation for Upper Egypt, ordered the gates lowered during the flood, and as a result the level of water was raised 4.9 feet. Some anxiety was felt as to the safety of the barrage under this tremendous strain. Sixteen feet of water rushed over the gates and thoroughly tested the efficiency of the downstream apron. Careful observations

mud, and made to hold water without years spent in reinforcing weak places. One of the most important developments is the efficiency of rock pitching on the downstream side.

In America there are many rivers where conditions similar to those at Assiut prevail. On some of them attempts have been made to raise the level of the water, sometimes with success, but more generally with failure. A striking example of such an attempt is the Gila Bend Dam on the Gila River, 60 miles below Phoenix, Arizona. Two attempts were made to raise this stream a few feet; both failed utterly, with the loss of more than a million dollars. At



Photo by Thos. H. Means.

PITCHING STONE FROM A BOAT TIED TO THE BARRAGE.

were made on the masonry, and so far as could be seen there was no evidence of weakness. Daily soundings were made along the downstream side and rock was thrown in constantly.

At the time the writer visited the barrage, in September, 1902, it was stated that the year's use had practically paid for the total cost of the barrage. In other words, the crops grown upon the land which the barrage saved from remaining dry were worth over \$4,000,000. It can readily be seen from this single year's experience that the barrage is a decided success.

This is probably the largest barrage of this type which has ever been built upon a foundation of sand, clay, and

the present time the remains of this dam and canal are useless, and thousands of acres of fertile land which could be irrigated with the water which annually passes the place are lying idle. In order to put a dam of stability on such a river as the Gila, and particularly in that part of it where there is no possibility of obtaining a rock foundation, where the sands and clayey sediment extend to a great depth, it is not possible for a cheap dam to hold. The engineering works must be thorough from the foundation up.

To construct a dam at this point would require a large sum, much larger than any irrigation company would be willing to put in the works, primarily

because dividends would not be possible for several years. There can be no question but that in the climate of Arizona, and with the fertile soil of the Gila Valley, and particularly with the fertility-laden waters of the river, agriculture can be made exceedingly profitable, and in the end substantial irrigation works will pay for themselves many times over.

There are many other rivers in our west where dams or barrages of the kind used in Egypt will be both efficient and profitable, and it is thought possible that American engineers may be interested in learning of the success of one of the monuments Englishmen are erecting to their honor in Egypt under a far-sighted governmental policy.

TWENTY-FIRST ANNUAL MEETING OF THE AMERICAN FORESTRY ASSOCIATION,

HELD AT WASHINGTON, D. C., DECEMBER 31, 1902.

THE Twenty-first Annual Meeting of the American Forestry Association was called to order by Mr. Geo. P. Whittlesey, the Recording Secretary, on December 10, 1902, at the Atlantic Building, Washington, D. C., at 10 a. m. In the absence of the President, Mr. F. H. Newell was unanimously requested to preside.

The minutes of the last annual meeting were read by the Secretary and approved.

In accordance with the suggestion of the Board of Directors, a motion was made and seconded that the meeting stand adjourned until 10 o'clock a. m. on December 31, in order that those members who wished to attend the "Convocation Week" meeting of the American Association for the Advancement of Science might be present at both meetings. This motion was carried, and the session adjourned.

The Association met, pursuant to adjournment, on December 31, at 10 a. m., at the Atlantic Building. Hon. James Wilson, Secretary of Agriculture and President of the Association, presided and delivered the address of welcome.

The attendance at this meeting was large, and a keen interest was evinced in the work of the Association. It was the general feeling of the members present that a more active program should be carried on during the year 1903. This feeling took the form of a resolu-

tion, printed in this report, which, if followed up, should result in greatly enlarging the Association's sphere of usefulness.

At the morning session the Chair appointed the following committees: On Resolutions, Dr. B. E. Fernow, Mr. E. A. Bowers, and Dr. C. A. Schenck; on Nominations, Col. W. F. Fox, Prof. H. S. Graves, and Mr. Otto J. J. Luebker; Auditing Committee, Mr. Geo. B. Sudworth, and Mr. Wm. L. Hall.

The Recording Secretary then read the Report of the Board of Directors, which, after several minor corrections, was approved and ordered to be printed.

Mr. Otto J. J. Luebker, Treasurer of the Association, then read his report for the fiscal year ending November 30, 1902, which was approved, and is printed as a part of this record of the meeting.

The Secretary announced that an informal luncheon would be served at 12.30, to which all visiting members were invited. A recess was then taken till 2.30 p. m.

AFTERNOON SESSION.

At the afternoon session Dr. B. E. Fernow, the First Vice-President, presided.

A telegram was read from Hon. Thos. H. McRae, of Arkansas, regretting his inability to be present. On motion of

Mr. Bowers, a reply was sent expressing the Association's appreciation of Congressman McRae's interest.

Mr. Sudworth, for the Auditing Committee, reported that the Treasurer's accounts had been examined and found correct.

Professor Graves, for the Nominating Committee, reported a list of officers for 1903, which, after a little discussion, was adopted, and the Secretary was directed to cast the ballot of the Association for the nominees. (See list on Association announcement page in this issue of FORESTRY AND IRRIGATION.)

Mr. Bowers, for the Committee on Resolutions, read the proposed resolutions, which were then taken up for discussion one by one. These resolutions, as finally adopted, are printed as a part of this report.

The work of the forest schools was described in an interesting manner by Prof. Henry S. Graves, of Yale; Dr. C. A. Schenck, of Biltmore, and Dr. B. E. Fernow, of the New York State College of Forestry.

Prof. Christopher W. Hall, of the College of Engineering, Minneapolis, Minnesota, presented an invitation from the Commercial Club of that city, the acting mayor, the governor of the state, and president of the State University, that the Association hold its next summer meeting at Minneapolis.

Mr. Philip W. Ayres, Forester of the Society for the Protection of New Hampshire Forests, extended an oral invitation to hold a summer meeting in the White Mountains, and said that a formal invitation in writing would be sent to the Secretary later. Dr. Schenck invited the Association to hold a summer meeting at Biltmore, N. C. These several invitations were referred to the Board of Directors.

Dr. Tarleton H. Bean, acting Chief of the Department of Forestry at the Louisiana Purchase Expedition, described the proposed forest exhibit. Dr. A. D. Hopkins described the work that is being carried on in forest entomology. Prof. Wm. R. Lazenby read a paper on "Forest Conditions in Ohio." The meeting was then adjourned.

RESOLUTIONS.

The following resolutions were unanimously adopted by the Association:

Whereas it must be conceded that if the present increasing rate of consumption of wood in the industrial arts continues, our natural timber supply will, under present methods, be exhausted within a generation; and

Whereas it cannot be expected that private interest alone will be sufficient to provide for future requirements:

Resolved, That the American Forestry Association urge upon the President the propriety of withdrawing from entry all the remaining public timber lands, and place the same under rational forest management.

Resolved, further, That this Association appoint a committee to act in conjunction with a similar committee from the American Association for the Advancement of Science to present this resolution to the President, and also to memorialize the various state governments to inaugurate a forest reservation policy, or to extend their existing forest reservations, and to secure legislation which will complete the establishment of a proper forest policy throughout the states.

Resolved, That a large and influential committee of the Association be formed to further all forest legislation in the United States by the appointment of five members, who shall have power to add to their number by appointing such subcommittees as they deem advisable in the various states; the Vice-Presidents to act as chairmen of such subcommittees.

Whereas a bill entitled "An act for the purchase of a national forest reserve in the Southern Appalachian Mountains, to be known as the 'National Appalachian Forest Reserve,'" has been passed by the Senate and is now before the House of Representatives of the United States for action; and

Whereas the passage of this bill during the present session of Congress is of the utmost importance, since the dangers threatening the public welfare from long neglect of the mountain forests in the

Southern Appalachian region are rapidly increasing:

Resolved, That all members of the American Forestry Association are urged to use their influence with the members of Congress representing their respective congressional districts in the interest of a speedy passage of the bill for the establishment of the "National Appalachian Forest Reserve."

Resolved, That this Association express its opinion that the logical sequence of the policy of forest reservations is to place the same under forest management and to combine all work regarding them in one department of the government, namely, under the Bureau of Forestry, Department of Agriculture.

Resolved, That this Association is in thorough accord with the policy of the United States in developing in all rational methods the irrigation resources of the arid regions, recognizing the interdependence of forestry and irrigation.

Whereas the growth of interest in forestry is spreading in the various states of the Union, and the need for concentrating and combining this interest is apparent for the advancement of forestry:

Resolved, That the Vice-Presidents of this Association are hereby directed and authorized to appoint committees for their respective states for the purpose of organizing forestry associations where the same do not now exist, and to obtain the necessary legislation for the establishment of rational forestry in the states, in all proper ways to further the interests of forestry, and especially to secure interstate action wherever interstate interests demand.

Whereas a Forestry Department of the World's Fair to be held at St. Louis, Missouri, in 1904 has been organized and a plan adopted which provides for a comprehensive and adequate display of the natural and economic history of the forest and forest industries:

Resolved, That this Association express its hearty sympathy with the objects and efforts of this Forestry Department of the St. Louis World's Fair, and pledges its assistance in securing exhibits illustrating forest conditions,

problems, and products, and its support in furthering in every way the purposes of such an exhibition.

II. REPORT OF THE BOARD OF DIRECTORS.

Forestry in 1902. Interest in forestry, which has been growing rapidly for several years past, was

never greater than during the year just ended. There has been unusual activity in a national, state, and local way. The movement started several years ago by a few public-spirited citizens looking to a more conservative treatment of our forests has grown with remarkable rapidity.

Perhaps the most noticeable proof of the hold that forestry is gaining is the wide demand for information concerning our forests and the proper method of treating them. Tree-planting for economic purposes has made great strides. No better illustration of the demand for information on forestry can be given than to call attention to the rapid growth of the forest schools.

Among practical lumbermen the question of conservative cutting of timber has received wider attention than usual during the past year, and this tendency continues the most significant of the whole forest movement.

President Roosevelt's keen interest in forestry has been of great value to the forest movement. In his several messages he has given a prominent place to the closely related forest and water problems.

The Forest Reserves.

During the year of 1902 new reserves and additions to those already declared amounted to 13,764,156 acres.

An innovation was the setting aside of two considerable tracts of land in the sand-hill region of Nebraska as forest reserves. The practicability of tree-growing in the sand-hill region has been demonstrated by an early experiment of the Department of Agriculture, and the work at reforestation now going on in these reserves will be watched with interest by the entire country. If success follows it will mean the reforestation of many regions now almost treeless.

The reorganization of the Division of Forest Reserves in the General Land Office, Department of the Interior, by placing a trained forester at its head has resulted in a much-needed improvement in the service. The success attained by such management so early in the work only emphasizes the need of bringing all public forest lands under such administration.

It is a matter for regret that the bill introduced in Congress last session providing for the transfer of the control of the forest reserves from the Department of the Interior to the Department of Agriculture was defeated. This transfer had the endorsement of the President, the Secretary of the Interior, and the Secretary of Agriculture.

The forest work in the reserves continues to be divided among three different bureaus. The General Land Office has charge of the administrative affairs of the reserves, including the patrol service, sale of timber, &c.; the mapping of them goes on under the direction of the Geological Survey, while the making of working plans and the technical advice in handling these lands is supplied by the Bureau of Forestry at the request of the Secretary of the Interior.

This method, as has been pointed out before, is unsatisfactory. The work of these several branches of the public forest service overlaps, and expediency demands that it should be under the charge of a single bureau.

With the passage of the National Irrigation Act the forest reserves take on added importance, and upon their proper administration in a great degree depends the success of the movement for the reclamation of the arid lands of the West.

The Bureau of Forestry.

During the past year the Bureau of Forestry has notably increased its store of knowledge on which forestry depends, and has made large gains in introducing practical management of forests of both public and private ownership. Its field-work has engaged 162 men, and has been carried on in 42 states and territories.

Thirty-seven applications were re-

ceived during the year, asking advice for the management of 200,000 acres. The total area now under management, in accordance with the working plans of the Bureau, is 372,463 acres.

By request of the Secretary of the Interior, the Bureau of Forestry has become his official adviser in matters of forest policy for the national forest reserves.

Extensive studies were made of commercial trees, and studies of the forest and its industrial relations were made in a number of states. Among the questions involved were the present and future timber supply, forest fires, relation of the forests to stream flow, irrigation, and grazing. The Bureau has discovered a less injurious method of turpentine orcharding than hitherto employed.

In coöperation with the Bureau of Chemistry and in response to urgent demands, the series of tests to determine the strength of the principal merchantable timbers, discontinued in 1896, have been taken up. A dendro-chemical laboratory has also been established in coöperation with the Bureau of Chemistry. A study of the effect of wood preservatives on the durability of timbers, together with measures for preventing the decay of commercial timbers, is being carried on in coöperation with the Bureau of Plant Industry.

A section of Forest Entomology has been established in the Division of Entomology, Department of Agriculture, which, in coöperation with the Bureau of Forestry, is investigating the ravages of destructive forest insects.

Two new divisions—the Division of Forest Extension and the Division of Forest Products—formed during the year, broaden the scope of the Bureau. In tree-planting the Bureau has sought to enlist the interest of the private landowner. Up to the close of the last fiscal year 262 applications for assistance had been received, nearly 200,000 acres examined, and 224 planting plans made. Not only does the example set by each plantation affect the neighborhood, but in many cases it has led to a public agitation of the question of tree-planting,

and extensive planting on other land has frequently followed.

Forest Extension. Marked progress has been made both in the improvement of the conditions which affect forest reproduction and in forest planting.

Improvement in the patrol system on the forest reserves, resulting to a large degree in preventing fires, has allowed reproduction to start in many places. Important studies have been made both on the reserves and private lands looking towards the discovery of means of facilitating natural reproduction. Forest planting on private lands has rapidly increased. In all parts of the country nurserymen are unable to meet the demand for forest stock, in spite of increased stock and many new nurseries. Among the states, New York and Connecticut have made beginnings, and are to be followed by Pennsylvania and Minnesota. The government has planted extensively in southern California, and is preparing to plant large areas in Nebraska.

Forestry in the States.

The interest in a large number of states, especially in the more thickly settled ones, continued to grow during the past year. In Pennsylvania the Forest Commission has continued its work with good results, a considerable amount of land having been added to the state reserves. The Pennsylvania Forestry Association has also continued to do excellent work in keeping up public interest in forest matters.

In New York reforestation on the state forest reserve has been undertaken by the Forest, Fish, and Game Commission. The Massachusetts Forestry Association has continued its work of interesting citizens of the state in local forest needs. A strong movement for bettering forest conditions in New Hampshire has been brought about by the Society for the Protection of New Hampshire Forests. In Iowa, the new organization, the Iowa Park and Forest Association, has done good work. The California Water and Forest Association has continued its efforts to bring about a proper solution of the most pressing

forest and water problems of that state. Wyoming has a recently organized forest association, while the Tennessee Forest Association continued its work begun last year.

The Minnesota State Forestry Board is continuing its work, especially in behalf of the reforestation of the cut-over lands of the state; the Indiana Forest Commission in its short existence has done much to arouse interest in the question of bettering the forest conditions in that state. The Commission in a recent report recommended the purchase of land for a state forest reserve. Michigan has a very active forest commission, which has, in the face of many drawbacks, started a movement in favor of conservative forest methods, that gives great promise. Reforestation on the state forest reserve has been begun by the Commission.

The women's clubs in various sections of the country have done much during the year to help the forest movement, notably in Minnesota and California.

Growth of the Association. During the year 383 new members were secured by the Association. Of these, 4 were life members, 5 sustaining, and 374 annual members. In the same period 86 members were dropped from the rolls, there were 35 resignations, and 10 deaths. The present active membership of the organization is 2,136.

Meetings of the Year.

A special summer meeting of the Association was held at Lansing, Mich., August 27-28, at the invitation of the Michigan Forest Commission. Upon invitation of the National Irrigation Congress, the Association also met in affiliation with the Congress at its tenth session, held at Colorado Springs, Colo., October 6-9.

The Magazine.

During the past year 80,200 copies of FORESTRY AND IRRIGATION, the official organ of the Association, were circulated. This is double the number published last year, while the cost to the Association has been practically the same.

The magazine has been enlarged and improved, and is generally accepted as

the authority in its special field. A growing demand for it is one of the surest signs of the great gain forestry is making with the public.

Appalachian Forest Reserve.

Progress was made during the year toward the establishment of a national forest reserve in the southern Appalachian Mountains. This movement started several years ago, has made headway, and has the endorsement of substantial people throughout the country.

A bill for the purpose of establishing this reserve was introduced at the last session of Congress, and provides for the purchase of 4,000,000 acres of land in this region at a cost not to exceed \$10,000,000. The Secretary of Agriculture is to designate the lands to be purchased and to take measures to preserve the forests. President Roosevelt, soon after the introduction of the bill, sent a special message to Congress urging its consideration. On June 24 this bill was passed by the Senate, but there was insufficient time for its consideration by the House of Representatives. The matter went over as unfinished business, but will be brought up at the present session.

The Forest Schools.

Nowhere has the progress in forestry been more noticeable than in the forest schools. At the New York State College of Forestry, the Yale Forest School, and the Biltmore Forest School, there has been a marked increase in attendance.

During the year departments of forestry were opened at the University of Michigan, the University of Nebraska, and the Michigan Agricultural College. In addition to the foregoing institutions, instruction in forestry to some extent is given at 45 other colleges and universities.

Forest Fires.

A matter for great regret is the continuance of destructive forest fires throughout the country. During 1902 the damage from this source to the forests of the country was greater than for a number of years. Forest fires in Oregon and Washington during a single week in September destroyed fully \$12,

000,000 worth of farm property and standing timber, while a number of persons lost their lives. Colorado, Wyoming, and Montana were also visited by unusually destructive forest fires.

To show how general was the destruction from this source, during a single month there were serious forest fires in twenty-two states. It is a serious reflection on the people that the most destructive fires of the year were due to carelessness.

An unusual interest in forestry has been aroused in the Hawaiian Islands. The question of improving forest conditions is being given much attention. Reforestation and the setting aside of forested areas as reserves are being strongly advocated. During the year a number of persons from Hawaii became members of the Association.

Hawaii and the Philippines. In the Philippines, the well-organized Forestry Bureau at Manila has continued to prosecute its study of the forest resources of the archipelago. The Bureau's working force has been materially strengthened by the addition of several trained foresters from the United States.

There has been a marked growth of interest in forestry in Canada during the year, and the questions of conservative lumbering on the remaining timberlands and the reforestation of denuded areas have received marked attention.

The Canadian Forestry Association continues to lead in the movement for bettering the forest conditions of the country. Interest in forest work in the United States is shown by the increased number of persons from Canada who have joined the American Forestry Association during the year.

Foreign. Another matter of interest is the increased number of requests the

Association has received during the past year from foreign countries for information concerning the forest resources and the progress of forestry in the United States. Several annual members from foreign countries were elected during the year.

III. TREASURER'S REPORT.

The Treasurer submitted the following report for the fiscal year ending November 30, 1902:

Otto J. J. Luebker, Treasurer, in Account with the American Forestry Association.

DR.		CR.	
To Balance December 1, 1901.....	\$447 83	By printing of "Forester" (November and December, 1901).....	\$343 83
Advertising.....	195 50	Illustrations for "Forester".....	19 12
Interest on bonds.....	180 00	"Forestry and Irrigation" (January-November, 1902, inclusive).....	3,240 90
Interest on deposits.....	15 96	Salaries of Editor, Treasurer, and Assistant Secretary, and clerk hire.....	565 58
Dues of annual members.....	3,485 00	Postage for Secretary.....	156 20
Sale of publications.....	85 15	Postage for Treasurer.....	81 00
Sustaining memberships.....	225 00	Printing and stationery.....	185 48
Life memberships.....	400 00	Expenses of Summer Meeting.....	152 90
Donations.....	11 60	Interest on \$1,000 loan.....	50 00
Sale of typewriter.....	35 00	Sundries, Secretary and Treasurer.....	60 79
Exchange.....	1 88	Rent (1901).....	43 00
		Annual Meeting, 1901.....	25 00
		Refunds of overpayments of dues.....	4 00
			\$4,927 80
		Balance.....	155 12
	\$5,082 92		\$5,082 92

Additional Assets.

Two Chicago and East Illinois 5 per cent bonds.....	\$2,305 00
Two Minnesota and St. Louis 4 per cent bonds.....	1,982 50
Dues outstanding.....	453 00
	\$4,740 50
A loan on one Chicago and East Illinois bond.....	1,000 00
	\$3,740 50

Unpaid dues to the amount of \$453 are still outstanding, viz., for 1902, \$313; for 1901, \$126; for years previous to 1901, \$14.

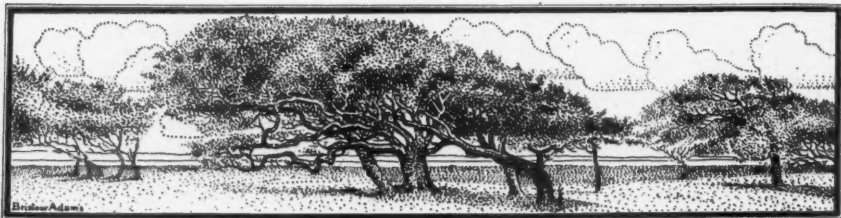
On March 1, 1902, seventy-six members were dropped for non-payment of dues, the amount thus lost being \$310.

Respectfully submitted.

(Signed)

OTTO J. J. LUEBKERT,
Treasurer.

DECEMBER 1, 1902.



COLLECTING JACK PINE SEED.

BY

ERNEST A. STERLING,

BUREAU OF FORESTRY.

THE establishment of the Dismal River and Niobrara forest reserves in western Nebraska by presidential proclamation last spring has opened up practically a new line of work for the Bureau of Forestry, and materially broadens the field of operations of its Division of Forest Extension.

Through permission granted to the Department of Agriculture by the Department of the Interior, under whose jurisdiction falls the administration of these as well as all the reserves, the Bureau of Forestry has entered upon extensive planting in these reserves in the sand-hills of Nebraska, with the

purpose of reclaiming worthless, unproductive territory.

In conjunction with and prior to the main work of tree planting comes the formation of forest seed beds and nurseries and the collecting of large quantities of forest tree seed.

Both forest tree seed and seedlings could be obtained in limited quantities from nurserymen and seed dealers throughout the country, but in order that all seed obtained might be fresh and true to name and come from desirable localities, it was deemed best that the collecting should be done by agents of the Bureau of Forestry. Moreover, by this plan it was felt that much desirable



OVER-MATURE, FOREST-GROWN SPECIMENS OF JACK PINE.



SECOND-GROWTH JACK PINE FOREST, SHOWING BUSHY FORM OF TREES ON EDGE OF CLEARING.

information could be obtained as to the most available localities, methods of collecting and drying cones, and extracting seed.

Coniferous tree seed have been collected this fall over a wide range of territory—from Michigan, Minnesota, and South Dakota to New Mexico, and also in southern California and Oregon. Seed of the same species have been gathered in widely separated regions, so that those best adapted to Nebraska conditions may be found. The seed, however, from only a portion of the species represented will be planted in the nurseries of the Nebraska reserves, the remainder being destined for planting in the mountains of southern California.

The influence of previous environment upon trees when transferred to new sites and the extent to which characteristics of the parent tree are transmitted to the progeny are as yet unsettled questions. Thus bringing together seed from regions geographically and climatically different and the subsequent

propagation of trees from these seed will, by means of the careful records to be kept, furnish valuable data for the solution of these questions.

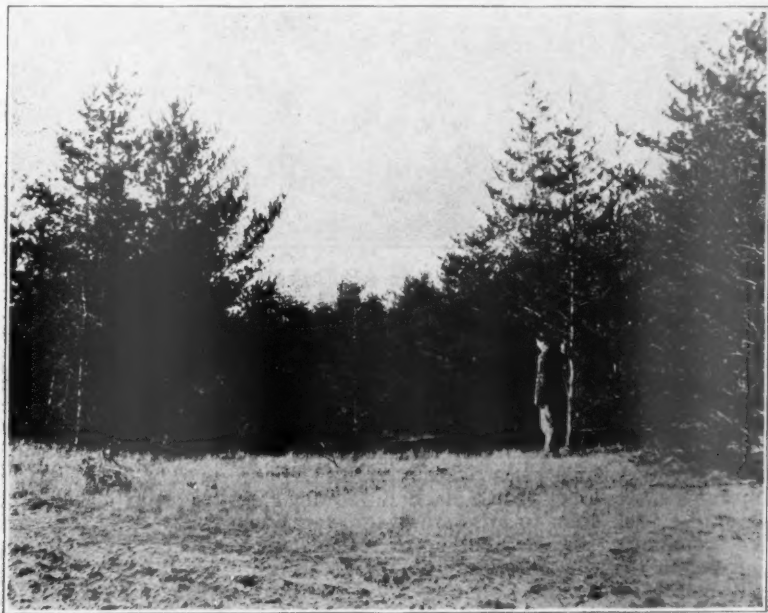
Among the several species from which seed have been collected, none give better promise of success in the new reserves than the little appreciated, and in fact often despised, Jack Pine (*Pinus divaricata*) of our northern forests. True enough, the tree is somewhat of a scrub and is not deserving of rank among our more valuable forest trees; yet for a ground cover and sand-retainer in exposed situations it possesses qualities which make it second to none. This pine will undoubtedly grow in the Nebraska sand-hills for two reasons: first, its native habitat is an unfertile, sandy region, which seems to have given it the inherent power of growing under rather unfavorable conditions; second, this species has already been grown successfully in the sand-hills of Holt county, where conditions are almost identical with those in the reserves in the sand-hill region. In 1891 the Di-

vision of Forestry, under the direction of Dr. B. E. Fernow, made an experimental planting of Jack Pine in Holt county, and today the trees in that plantation are 16 to 20 feet high and growing vigorously. More conclusive evidence of the possibilities of the species in this region is not needed, while our faith that the sand-hills will grow trees is greatly strengthened thereby.

The work of collecting Jack Pine seed was carried on in two regions last fall, namely, Michigan and northern Minnesota. It was the writer's privilege to conduct the work in Minnesota, where about one and one-half bushels of cleaned seed, worth in the neighborhood of \$200, were collected in the vicinity of Brainerd. As work of this kind had not been done by the government before, and very little was known concerning the tree or its seed, an attempt was made to gather information as well as seed.

The Jack Pine is well known as a scrubby, yet sturdy tree, a progressive, independent sort of fellow that thrives well under very adverse circumstances.

It occurs extensively in almost pure stands on the sandy plains of Michigan, Wisconsin, and Minnesota, where it has always held full possession, and in many places creeps in on better land after the more valuable Red and White Pine is removed. In good soil it forms a tree 60 to 70 feet high, with a straight, clean trunk, valuable for fuel, and occasionally is sawed into boards, and is also used for posts or cross-ties. On poor soil and in exposed situations it becomes low and scrubby, with limbs growing to the ground, often forming dense thickets, and again occurring scattered. It is also found in the borders of burned areas, which it soon seeds and reclothes with young trees, and on the dividing line between the prairie and woodland, where it acts as the vanguard of the forest. In its struggle to advance in the dry, open land beyond its existing range it is exposed to the heavy winds and driving sand and becomes more gnarled and scrubby than usual; but nevertheless the Jack Pine hangs on tenaciously, seeds profusely, and ultimately establishes itself out in the land



TYPE OF JACK PINE MOST PRODUCTIVE OF CONES.

which Professor Sargent once described as the "debatable ground."

The characteristics which thus enable it to thrive under varying unfavorable conditions are several, among which may be mentioned a good root system, great fecundity, resistance to fire, high germinative per cent of seeds, and the protective nature of the cones. Such a tree is usually described as hardy, though general hardiness is not a constitutional characteristic, but rather a combination

which otherwise might remain enclosed for years.

In the loose sandy soil the roots strike down for a great distance. Storms of sufficient violence to break down the trees often occur, but nowhere was a tree seen which had been uprooted.

Nearly every season is a seed year for the Jack Pine, and even if an off year occurs there are usually enough closed cones left over from the previous year to prevent a scarcity of seed. The



JACK PINE CONES FROM WHICH SEED HAVE BEEN EXTRACTED.

of several such self-preservative qualities of the tree and its fruit.

On the sandy barrens which are its habitat the Jack Pine is found to be wonderfully resistant to the annual surface fires which sweep over the region. The trunk is occasionally scarred, but no injurious effects other than a blackening of the bark seem to arise from such a scorching. In their relation to seed dissemination, these fires are decidedly helpful, since the heat serves to open the cones and free the seed,

seed of most conifers require a favorable seed bed, natural or otherwise, for successful germination, but the Jack Pine seed seem to sprout almost anywhere. Young seedlings of various ages can be found in varying locations from the pure sand of the open to the well-tilled garden spot, although the greater number occur in the partial shade along roadsides and in the edges of clearings.

The trees which were found best adapted for cone collecting were of sec-

and growth, the most productive ones being the bushy form found on the edge of clearings or where the forest was quite open. The tall, overmature forest-grown trees were in general not very productive, although the cones they produced were of high quality.

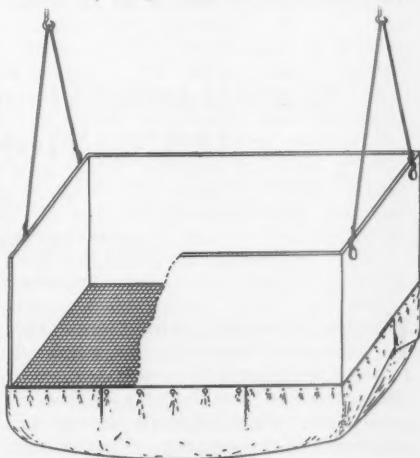
The cones were stripped from the trees with the hands, by a backward pull, thrown into pails, and transported and stored in bags. A hatchet was often used to lop off well-loaded branches which were out of reach. All picking was done from the ground, although in many cases a short ladder could have been used to advantage. Where cutting is being done, the best plan is to follow the choppers and pick the cones from the felled trees.

In stripping the cones from the trees a short piece of wood with several needles attached usually remained on the base of the cone. The wood does no harm, but the needles should be removed, or they will come off during the drying process and mix with the seed, making a mixture which is hard to separate.

The cone of the Jack Pine with the exception of Knobcone Pine (*Pinus attenuata*), is probably the hardest, most unyielding one of the family, and holds its seed most tenaciously. Two points in its favor are that it is not resinous, and that the prickles on the mature scales are so reduced in size as to be harmless. Normally the cones on the warm sunny portions of the tree open, either wholly or in part, the season they mature, while those which are in the shade remain closed, often for years. In Minnesota this year from 40 to 50 per cent of the cones had opened on the trees enough to drop most of their seed by the middle of October. They open fully during a warm, dry period, then with the recurrence of wet, cool weather the scales close again. Many of these open cones, and some closed ones, persist on the tree for years, but the open ones after the first season become dark in color and remain with the scales expanded. Seed are borne only in the upper two-thirds or three-fourths of the cone.

In order to dry and open the cones sufficiently to loose the seed, artificial

heat must be resorted to, and even then a temperature as high as 150° Fahrenheit must be maintained in order to do rapid work. If dried in bags and boxes where a good circulation of air is not obtained, it requires two or three days even in the above temperature to open them all. The best method is to suspend shallow boxes over the source of heat, with a screen in the bottom fine enough to prevent the egress of the seed and yet allow free passage of the air. If spread in shallow layers in boxes thus arranged, most of the cones will open in six hours and all within twelve hours, in a temperature of 140°-



SCREENING BOX FOR EXTRACTING JACK PINE SEED FROM CONES.

150° Fahrenheit. If dried gradually the cones never open so fully as if put when moist directly into the heat of the drying-room. A small tight room or, better still, a small cellar heated by a stove is the most practical drying-room. Solar heat in the fall of the year would not open the cones to a practical extent.

When thoroughly dried and opened the cones drop their seed very readily. A cheap yet efficient screening apparatus can be made from an ordinary box of convenient size by placing in it a double bottom and suspending it from the ceiling by wires, so that it swings freely. The first bottom should be of wire screen (sand screen will do), with

meshes about $\frac{1}{16}$ of an inch square. The second or lower bottom should be of canvas, and serves to catch the seed as they fall through the screen. When the open cones are put in such a box and shaken vigorously the seed fall out and down through the screen into the canvas below. The empty cones can be removed from above and the seed taken out from below through a flap in the canvas.

As very little was known about the Jack Pine cone or its seed, counts and measurements on a considerable number of samples were made with the following results. These figures, however, must not be considered as abso-

lute, because they are not based on a sufficiently large number of samples, and at best would be true only for the season and region in which they were collected.

Cones per bushel.....	2,500
Seed per cone {	
Vital.....	40
Defective.....	10
Total.....	50
Length of cone.....	1.7 inches
Width of cone.....	.7 inch
Scales per cone.....	73
Number of wormy cones.....	7 per cent
Heat required for rapid drying....	150° Fahr.
In drying cones expand.....	150 per cent
Average number of seed per pound....	109,000
Weight of seed with wings....	$\frac{1}{2}$ lb. per quart
Proportion of wings to seed.....	27 per cent
Purity.....	80 per cent

SOCIOLOGICAL ASPECTS OF THE IRRIGATION PROBLEM.

BY

GUY E. MITCHELL,

EDITOR OF THE NATIONAL HOMEMAHER.

IF the agricultural population of the arid west should be redistributed among the farms of the eastern states, a transformation would ensue almost as great as that which followed the original settlement of these states. This change would come through the irrigation practices, now become a second nature to the westerner, which he would introduce throughout the east.

But, assuming that the methods of irrigation which would be thus transplanted would become general in the east, why should any great transformation ensue? For answer we must look to the conditions in the arid west where irrigation does exist. What do we find? We find that crops will not yield without irrigation, and that this necessitates the diversion of water from rivers into canals and the carrying of it to the agricultural land. This is always an expensive operation, and results in irrigated lands being comparatively high in price; at the same time they are extremely productive. Largely from these

two reasons irrigation has brought about a system of small farms. There is also a constant tendency among the farmers in irrigated districts to cut down their producing area and give closer attention to the cultivation and methods of watering the crops.

This is all vastly different from the agricultural conditions as found generally in the east, where men are continually trying to acquire additional farm lands. Yet more widely different are the social conditions which are the outgrowth of the two classes of farming. In the east we have as a result of the comparatively large areas under individual cultivation—one hundred, two hundred, or three hundred acres—farm houses scattered at wide intervals, with poor means of communication; and we hear much of the isolation, dreariness, and discontent of farm life, and of the gravitation of the farming classes toward the cities.

On the other hand, the best type of rural irrigated communities closely ap-

proaches the ideal. The farms and orchards are small—thirty, twenty, ten, and even five acres—the land is highly improved, houses are within hailing distance of one another, good roads prevail, schools and churches are readily available to all, mail is delivered daily, and the farmer though still breathing the pure air of the country finds himself and his family surrounded by the comforts and conveniences of the city suburban resident. He inclines to public-spiritedness and lends himself readily to coöperation in many things. Travelers and students agree that in our western irrigated communities is to be found the most sterling citizenship in the country. More virtue, more morality, more law-abidingness, more sobriety, more thrift, more general intelligence, more patriotism, and more contentment exist and are fostered in hundreds of western communities today as a result of the small rural home than in any other section of the United States. From this glimpse we see what changes might come to the eastern rural districts were irrigation and intensive farming generally introduced and individual holdings cut down in area.

The available public land where a man can take up a homestead of 160 acres and make from it a living for himself and family has become exhausted. The only remaining public lands are in the arid region, and unless water can be secured they are worthless for settlement.

It has therefore come about that irrigation has become necessary to make the homestead law operative in its original force. From this time on the great outlet for the surplus of eastern citizens lies in the arid regions of the United States.

It is estimated that there are between 60,000,000 and 100,000,000 acres of irrigable land in the west. The absorptive capacity of this area when reclaimed will be enormous when it is remembered that all the great irrigation communities of the United States today, which constitute the bulk of what is now the west, aggregate but about seven and a half million acres, or perhaps 8 per cent of what will be eventually irrigated.

Economists and philanthropists have dwelt at length upon the possibilities of relieving the congestion of eastern centers by transporting men to thousands of small intensive farms which will be created by the application of water to these lands. The feature of the problem, however, not generally recognized, yet pregnant with promise, lies in the fact that while it may not be possible to redistribute the irrigators of the west throughout the east, yet before these western desert areas, with their great capacity for a dense agricultural population, have become settled, and while they are becoming settled, the leaven of irrigation will be steadily working back eastward.

It is no fantastic dream to believe that with all the vast capabilities of the west for irrigation, as many acres east of the one hundredth meridian will eventually be artificially watered as those which will be irrigated to the west of it, and that the larger farms of the east will be subdivided into the smaller acreages to be found now in Utah and southern California.

We will then have become a nation of small rural homes. Each land-owner will be found raising a diversity of crops, dependent upon no single one for his income or his home food supply.

To what extent such an evolution will serve as a cure for some of our great social evils is a question. It would seem as though it might be effective. There is that in the soil and sunlight of America to-day which would kill every germ of anarchy and discontent now breeding in the United States if these evils could be reached. The problem is to spread the germs out in the sunlight. Could the slums and the sweatshops of Chicago and New York and other great cities be divested of their population and their people placed upon the land and given an ownership in a piece of ground, or a chance to earn a home and own a tract of land sufficient for their support, we would find our social problem largely settled; while the great, broad, and unoccupied areas of the country could absorb the population of a score of cities like Chicago and New York.

It is argued, of course, that it is use-

less to talk about inducing the people of the slums to go to farming, even if they are given an attractive opportunity; that they are idle and shiftless and will not work. But such a view does not reach to the bottom of the situation. There is always a surplus in a great city. Thousands are apparently crowded out of their employment by others more successful. They are displaced by neighbors just one degree more fortunately endowed or more persistent or more competent. Now the magnet of cheap land and the opportunity to secure a home and a bit of soil by working for it would attract a constant stream of this better class from the great cities, and they would leave opportunities for the less fortunate. A current would be formed, running through the center of an otherwise stagnant pond, keeping the whole body in constant if only slight motion.

Were the present population of the United States distributed in comparatively equal ratio throughout its productive area, the capacity of the country to support the people would be taxed not to the quarter-way mark. It is the congestion that hurts. The work which the government is beginning for the reclamation of the arid lands of the west is fraught with infinite possibilities for good. It is the greatest work which any government at any time has ever undertaken. Thousands of men and women are to-day ready and anxious to

go upon this desert land just as soon as the irrigation works are constructed and water supplied, which is to transform it into a Garden of Eden. They are of the class which built up the Mississippi Valley and northwest states from wildernesses into strong, powerful, and wealthy communities. They did it usually without money, with only their strong arms and their sturdy hearts. They acquired their land from the government in exchange for their act of cultivating and making their homes upon it. This same proposal, slightly modified, the government now holds out to the new settlers of the far west. They may take a small tract of land sufficient for a home, free of cost, paying for the water which the government puts upon it, on long time. Thus the man with no capital can again go forth and provide for himself and family a prosperous country home.

Under wise administration arid America has a glorious future. With its countless small farms and rural homes, communities where people live in the open air, till the soil with their hands, and yet enjoy the privileges and advantages of the city, it will prove the sheet anchor of the republic in any time of national peril. From it will radiate eastward the same idea of the division of the large into small farms and the utilization of the stream in making certain and increasing an unreliable crop.

THE NORWAY SPRUCE IN IOWA.

BY

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PROFESSOR OF BOTANY, IOWA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

THE writer has been convinced, from observations made in various parts of the state, of the useless expenditure of a large amount of money in planting trees that are wholly unsuited to our conditions.

The early settlers in Iowa were desirous of obtaining a growth of conifers.

The success attained in some portions of the east by the growth of Norway Spruce (*Picea excelsa*) caused many of them to plant this species. Thousands of trees have been set out on all kinds of soil and under varying conditions, with the result that probably more than fifty per cent of the trees set out in the

sixties and seventies are now dead. On the college grounds here more Norway Spruce was set out than any other species of conifer. At a rough estimate, probably thirty per cent of them are now dead. Some may, however, last ten or twelve years longer. My prediction is that during the next decade more than seventy-five per cent will be dead.

The Norway Spruce in some localities has been more successful than in others. On the college grounds here, where there is a rich black prairie soil underlaid with an impervious yellow clay, the Norway Spruce is a failure. In Linn county the trees are equally short-lived. Very few of those set out thirty and thirty-five years ago are still living. There the ground consists of a black, sandy loam underlaid with gravel and clay. The writer observed a few choice locations in Monroe county, southeast of Des Moines, and also in Marshall county, where the trees are apparently in a healthy condition. There are other counties where the tree has done fairly well. Generally speaking, however, the species is a failure in this state and should not be used for commercial planting or for ornamental purposes.

It seems to me that an important lesson may be learned from the earlier experience in this and other western states of the unadaptability of certain trees to certain localities, and that it

would be a wise policy for the state government to issue lists, to be extensively published, of those trees which are best suited to local conditions. These lists should be scattered broadcast, so that in a generation from now some useful products could be obtained. Many nurserymen continue to grow the Norway Spruce because there is a demand for it. For Iowa at least the White Spruce (*Picea alba*) and the Blue Spruce (*Picea Parryana*) are preferable. The accompanying table, containing measurements of a number of specimens, shows the rate of growth of the Norway Spruce in Iowa and in La Crosse county, Wisconsin:

Locality.	Age, years.	Diameter in inches.	Height in feet.
La Crosse, Wisconsin.	34	27 1/2	60
La Crosse, Wisconsin.	21	17	40
Eddyville, Iowa.....	35	24	55
Eddyville, Iowa.....	35	17	60
Eddyville, Iowa.....	34	25	55
Eddyville, Iowa.....	34	27	65
Eddyville, Iowa.....	25	19	56
Eddyville, Iowa.....	25	14	35
Eddyville, Iowa.....	25	15	38
Ames, Iowa.....	27	12	50
Ames, Iowa.....	27	10 1/2	48
Ames, Iowa.....	27	9 1/2	40
Ames, Iowa.....	27	13	50
Ames, Iowa.....	27	10	45
Ames, Iowa.....	27	13	40
Ames, Iowa.....	34	16	55
Ames, Iowa.....	34	20	60

THE RELIGION OF THE ANCIENTS.*

BY

MRS. GILBERT McCLURG,

DELEGATE FROM THE GENERAL FEDERATION OF WOMEN'S CLUBS

IT is my privilege to bring you greeting from 212,000 club women and their gracious president, Mrs. Denison, all of whom wish God-speed to the National Irrigation Congress and the American Forestry Association. Some of these women live in regions where, as the west-

ern rancher said, they actually prefer "that old-fashioned shower method." Therefore their interest is born of the altruistic spirit which animates the thought of the Twentieth Century Club women. A vicarious sympathy is none the less sincere.

*Address delivered at the Tenth National Irrigation Congress, held at Colorado Springs October 6-9, 1902.

To other women whom I represent the trickle of the tiny canyon stream, curbed by its turbine wheel, stands for the power to evoke beauty and fragrance out of an arid solitude and a barren life.

It is fitting for the greeting sent from the women of the West and East to reach the Congress in Colorado—that state which gives a voice and vote to men and women alike—doubly fitting that it is delivered in Colorado Springs, originally a colony founded on pure cold-water principles, and to this day weird and woeful restrictions hedge about the wight who would fain depart from them.

No one may take the measure of a carriage like the man who travels afoot. Colorado was once a part of the great American desert, and that is why today she has learned to put 1,611,271 acres of land under irrigation, and her reservoirs are set in the continent's crest like clear gems.

Would I might say that Colorado had saved her forests in equal measure with storing her floods. The pitiful, denuded summits and divides of the crest of the continent cry aloud to us for their once green-garmenting. It seems as if nowhere had man been so pitiless, so lavish of tree life, as on the Continental Divide. On the Chilile grant in New Mexico, out of government jurisdiction, the loftiest plummy pines of the region are to be found topped and prostrate— butchered to make a tie-man's holiday—one railway tie perhaps cut from the dying monarch and the residue of the wood left to rot, while the sawmill gets in its deadly work, and scrubby savin and piñon grow up where once the pine held sway. At Chilile is a mountain on which green growths flourish. The casual observer sees nothing markedly to distinguish it from the surrounding hills; but it is in reality a mountain of solid sawdust—a landmark of the country thereabout; a monument of the thousands of trees that perished there.

As contrast, you think of the twigs sharpened and shaped by careful hands at Paris and sold as "fagots" for 10 centimes. These came from the forests which inspired Corot and D'Aubigny,

where the inspector chooses what to take and what to leave, and where the poorest twig has an allotted service. Here we have our sawdust mountains. We demand water storage, but the forest can best of all hold back and equalize the flow of the truant streams. It was Martin Luther who opined that a plant in the window was powerful enough sometimes to keep the devil outside; and if one plant can do so much, what may not be accomplished by a whole forest? What devils of drouth, and cyclones, and destructive floods are held at bay by the conservation of our forests? Irrigation spreads the feast; forestry adds the grace after meat.

The Colorado women, later joined by those of California, introduced at the biennial convention of the General Federation of Women's Clubs at Los Angeles in May, a resolution endorsing and requesting government aid for irrigation. This resolution was adopted unanimously. When I first broached this proposed resolution in the Colorado committee-room, one delegate demurred, saying that politics had no place in the Federation of Women's Clubs. Mrs. Sarah Platt Decker, our foremost Colorado club woman, rejoined: "Madam Chairman, irrigation is not *politics*; in the West it is *religion*."

Irrigation always has been the religion of the arid lands—the faith which sees in the desert the springing grass blades. The early powerful civilizations of which recorded history remains were fostered and developed on breezy, arid plateaus with artificial systems of irrigation. Such was that which carved the mighty bas-reliefs of Nineveh, or reared the hanging gardens of Babylon, or which raised ancient Egypt from the ranks of a bankrupt nation to rich land, with teeming population and all the kindly fruits of the earth, under the beneficent influences of Father Sihor.

The western world was to furnish yet more magnificent proofs of the transcendent value of irrigation as the foundation of nation-building. It was the lot of Spain, says Dr. Draper, to destroy three civilizations superior to her own, namely, that of the Moors, of the Aztecs, and of the Peruvians. These last two

empires stand unparalleled in the power and beauty conferred by as perfect systems of irrigation as the world has seen. Tenochtitlan (like Venice), whose gleaming white buildings dominated four azure lakes—a city built upon the

southwest has led me among the ruined homes and wasted garden plots of our ancient civilization.

It was not to be expected that the bulk of the pre-Columbian sedentary aborigines of America would attain the



MRS. GILBERT MCCLURG.

waves—and Peru, the land teeming with agricultural wealth from the coast valley to the terraced steepes of the Sierras, owed their beauty and power to the ordered ministration of conducted water. As some of you know, my work in trying to preserve the noble ruins of the

agricultural development (and the irrigation system accompanying it) of those two great nations, Mexico and Peru. In Colorado we find rock-hewn cisterns made by the Pueblo Indians, zigzag terraces on the canyon sides, and open stone-set ditches, where they watered

their garden patches. In New Mexico there are only 600,000 acres of land under irrigation out of the 80,000,000 acres which make up the territory, and except in a few instances these systems of irrigation were devised by the Indians and improved by the Spaniards, having done service for three centuries.

In Arizona, where the pre-Columbian culture in many points approached most closely the distinctive development of Mexico, there were once 2,000,000 acres of land under irrigation where the modern American can show but 337,000. In the valleys of the Salado and Gila rivers there were several long-forgotten cities which seem to have had from 100,000 to 200,000 inhabitants, and their waterways are said by engineers to have been marvels of engineering skill.

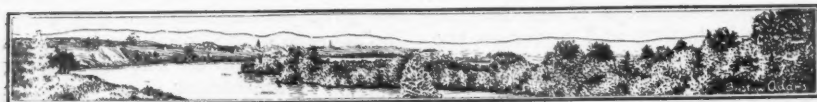
In considering what the blessing of water meant to these ancient Americans, we have only to remark the supreme part it played in their folk-lore and religion. "The whole religion of the southwest," says Mrs. Nuttall, "may be summed up in a single phrase—'a prayer for rain!'"

It is as impossible for us to put ourselves in the position of a man without a base of supplies, whose very life might depend on the presence or absence of water, as it is for us, with our myriad interests and directed thought, to realize what natural phenomena—the cloud, the rainbow, the lightning, and the growth of maize—meant to the ancient Pueblo Indian, who first had our lands, in his solemn, undiverted, face-to-face with nature. The zigzag flash of the lightning across the horizon meant succor in famine; it meant assured crops, and resurrection; and gave birth to the form of snake worship which prevailed in our southwest—the deification of the snake, whose sinuous course suggested that of the lightning, as the principle of water. The snake dance at Moqui

Pueblos is a rite celebrated in honor of water—the snakes symbolizing the rain, and the guajes, or rattles, the thunder which goes with the lightning. In Peru there was sometimes employed a system of concentric circular canals, with belts of green between, that might easily have suggested the coiled serpent, which divides honors with his undulating brother. Thus the water-dog, the frog, the tadpole, the dragon-fly floating over the canal—even the horned toad, which comes out after the rain, were associated in the Indian mind with the blessing of water and received a certain fetich worship. There is something pitiful in the constant iteration, on textiles and pottery, of the old symbols for cloud, rain, sun, and the heart of the sky, and above all, of the water-snake, of which the word-of-mouth legend handed down by some unknown Pueblo Homer has said:

"Fear not the serpent shafts of the lightning as they rattle loudly, that the earth be replenished with their children the serpents of water the rivers of life."

Thus the ancient aborigine of the arid plateaus prized and even worshiped as the most beneficent factor in his scheme of existence that chrisom of water which we contemporary western Americans are beginning to value from afar. And now begins irrigation in good earnest. Over the faint furrows traced by long-dead civilizations his canals will be redrawn. The old green will reclothe the arid slopes, and a hundred new products will be added to the old. Homes will rise above crumbling ruins. For this earth of ours moves in cycles, and where her population was dense and her industries most thriving and the problem of living easy of solution, time and conquest and the encroaching desert drew a veil, and silence! But now new life invades the solitudes, and the Midas touch which turns the desert sands to gold is the presence of water.



THE FIXATION OF SHIFTING SAND.

BY

DR. JOHN GIFFORD.

OWING to the abundance of good land throughout the world, the reclamation of wasteland, especially waste sand-land, seems superfluous. "Wasteland," however, is an extremely indefinite term. It merely refers to territory which in its present condition is unproductive. The possibility of wasteland is often high. The land of greatest possible productivity is the one in which the ultimate resources—sunlight, warmth, moisture, and suitable soil conditions, on which plants depend—are in sufficient quantity and in the proper proportion. The difficulty may often be slight and easily corrected. Wasteland is often located in very desirable situations, and location is often the primal factor in land valuation. This is especially so of seashore sands. The question of reclamation is usually a matter of degree, anyway, because almost all land, either for forest or field crops, needs considerable preliminary treatment before capable of producing the best results.

There exists in this country an immense amount of waste sand-land, much of which is located in extremely desirable situations. In spite of its location, it is often ridiculously cheap because of its desolate appearance and apparent incapacities. Most of these lands are unproductive because of neglect, or have been rendered waste by careless cutting and burning.

It is almost a rule that those lands which become waste the first and easiest are those which are most difficult to reclaim, and it may also be said that those species which are the last to disappear in the struggle are usually the first to appear when adequate protection is afforded. This is especially so in sand areas where drouths, fire, wind, insect pests, and a host of other destructive agencies are at work, although accident here as elsewhere plays an immeasurable rôle.

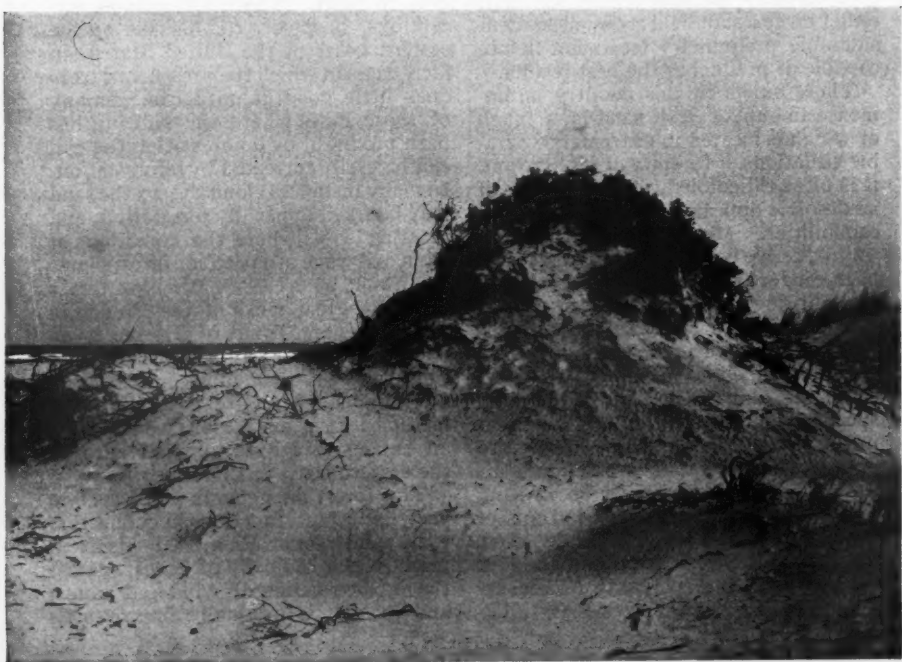
Nature is and has been constantly striving to clothe these wastelands. By the gradual improvement of soil, although it may cover a long period of years, sandy wastelands in time become clothed with an arboreal growth in the presence of sufficient moisture and warmth. European foresters have carefully studied this process of soil betterment, and have rendered productive in a comparatively short time vast areas which would otherwise have remained waste for centuries.

These sandy lands are in general forestal in character—that is, except in special instances, such as the pineapple sands of the east coast of Florida, better fitted and in many cases only fit for forest crops. When these sands become sterile by abuse, and the growth which covers them becomes thin, the sand begins to shift. There are notable exceptions, however, to this rule on the eastern coast of the United States—in fact, cases in which the presence of trees does little good, if not harm. In any of those cases where the shifting has been produced by deforestation the evil can be easily corrected by reforestation. In many instances along the sea the sand may be fixed in part by forestation, and in other cases where the conditions of wind and wave are peculiar forest planting would be useless. We have freely used the great work of the French in the Landes and Dunes of Gascony as an example of what can be done in other countries in the same line, but we have often failed to realize that the same method for various reasons would prove an expensive failure in many parts of the eastern coast of this country.

The forest in general performs two very important functions in connection with sandy soil. First, it holds it in place in the majority of cases against the erosive action of wind and water; and second, it gradually improves its



A DUNE IN THE PROCESS OF FORMATION ON THE JERSEY COAST.



THE TOP OF A DUNE ON THE JERSEY COAST HELD BY A PATCH OF BAYBERRY.

quality. Both the chemical and physical conditions of the soil are improved. While this process is in progress the tendency to shift grows less and less. In the case of coarse sand, in spite of the fact that silica is obstinate, the granules are comminuted in the presence of decomposing humus. It is not always the fine sands that shift, although of course fine particles are more easily transported by the wind. Fine sand holds moisture and fertility, so that the natural growth of vegetation is vigorous and soon checks shifting. It is the coarse sands, such as those of the Bay of Biscay, which are the most troublesome to control.

Coarse sands are hungry. Because of leaching and rapid oxidation, they become sterile quickly and easily. Sandy soils are not objectionable, because they consist mainly of silica. Sand may be ground to the consistency of clay. They are difficult to control only when they are coarse in nature. Fortunately most of the sand along the seacoast of the eastern United States is fine in nature, mixed with particles of other materials, and very easily controlled.

The sand-hills of many districts absorb dew from the atmosphere. Arabs go to the sand-hills in parts of Africa for water. The sand dunes of the Dutch coast supply water to large cities. The sand of the sand-hills of Nebraska is often remarkably moist a short distance beneath the surface, even in dry times. This is so also with the chalk downs of England. The natives dig cavities on the downs. These are cemented or puddled to prevent leakage. The deposition of dew or fog in these hollows

supplies water for stock. Gilbert White says: "Few phenomena are more strange than the state of little ponds at the summit of the chalk-hills, many of which are never dry in the most trying drouths of summer."

The presence of moisture of this kind is one of the reasons, no doubt, why vegetation does so well on the tops of dunes. Since the supply of sand comes from the shore, the force of gravity soon overcomes the lifting power of the wind, and the dunes are cut out from below in the form of drafts. The propensity to



FOREST OF MARITIME PINE ON THE DUNES IN GASCONY. THE WHITE SAND IN FOREGROUND IS THE EDGE OF A FIRE LANE.

shift is slight at night and during rainy days. None of these dunes shift bodily. The sand dries on the surface and skips along as does drifting snow.

The fixation of all shifting sand is primarily dependent upon the checking of the source of the supply. This is of course easily accomplished by planting in the case of inland dunes, but along the shore it is otherwise where the sand is being constantly transported by the ocean currents, and more sand is being formed in other regions by the great ocean mill.



NATIVES OF THE FRENCH LANDES. MOST OF THE TERRITORY SHOWN IS NOW COVERED WITH PINE TREES.

In the case of inland shifting sands the Banat Desert of Hungary is notable. Much of this is being fixed by the planting of the American Black Locust. The movement of the sand may be temporarily stopped by the construction of brush or wattle fences on the side from which the prevailing wind comes. In case the soil is too dry for the direct seeding or planting of the locust, or if the bacteria which it needs for proper development are absent, the tree should be started in good soil in paper pots. Pot, plant, and earth may then be planted at almost any time of the year. The pot soon rots, the soil becomes inoculated, and the plant suffers no shock in planting. Once started, the locust will reproduce itself by suckers, and the restless sand, if inland and away from an exhaustless source of fresh sand, will soon be permanently fixed. Poplar, pine, casuarina, and other trees have been used for this purpose.

In the case of shifting sand along the ocean, reclamation by tree-planting is only possible here and there. In few cases is it possible by forest-planting alone. In the zone of restless sand close

to the shore there are no species of trees which will grow well without some sort of protective works in the form of an artificial dune or fences of brush or masses of hardy shrubbery, such as beach plum or bayberry. In checking the source of supply close to the shore, a littoral dune artificially constructed and held in shape by beach grass is necessary in certain locations. I shall not describe the manner of the formation of this dune, because there is no place on the coast of the eastern United States to my knowledge where it is necessary. In France this littoral dune is kept in shape by beach grass. It is a constant labor to control it. Squads of men and women on the littoral dune in France are kept at work digging up the beach grass, there called *gourbet*, in places where it is not needed and planting it on other parts of the dune which have blown out. It is questionable whether we can use beach grass to any advantage on the eastern coast of this country. We have several native dune plants which are superior. The beach grass in itself is a dune-former. It seems to grow well only in places where the sand is actually

shifting. In a large number of cases, with exceptions such as Cape Cod, the trees along the coast are the obstacles which produce the dunes. Our prevailing winds are from the west, and just as soon as the vegetation becomes so thick that it prevents the west wind from blowing the sand back into the ocean, a dune forms equal in height to the height of the obstacle. Dunes in many cases along our coast may be removed by thinning out the forest and removing the tropical tangle of grape, Virginia creeper, etc., which prevent the west wind from blowing the sand back into the sea. It is wise to do this early, because the trees will soon be smothered by the sand. This sand, in combination with the wind, forms a blast which nips vegetation as though cut with shears.

In many places our beaches are in need of intelligent treatment. The method employed must be carefully studied in each location. In a few instances fine bathing beaches are being

injured and inlets are being clogged so that the oyster industry, owing to the freshening of the water, is in jeopardy; in other instances the sand is invading more valuable property and fine forests are being buried. These forests, in at least a few instances, could be saved by severe thinning and by the removal of creepers and bushes.

Perhaps the most difficult piece of work in the line of said fixation has been accomplished in France. The dunes along the Bay of Biscay clogged up the inlets. The back country called the Landes became flooded and pestilential. Today it is a health resort covered with a fine growth of the Maritime Pine.

The Dutch use the dunes as dikes, in the lee of which there are beautiful villas and gardens. Much has been accomplished in Denmark and along the Baltic. In India the dunes on the Madras coast have been fixed by plantations of *Casuarina* trees.

In this country the most has been ac-



PLANTATION OF BEACH GRASS AND PITCH PINE ON CAPE COD FOR THE FIXATION OF THE SOIL.

complished at Cape Cod. Because of its peculiar shape and situation, this land is probably the most difficult piece of sand to control on the eastern coast of America. Enough has been already accomplished there to prove, however, that the problem is not so difficult as was at first supposed. Although there are probably still greater difficulties to contend with on the Pacific and the shores of our Great Lakes, none of them, it seems to me, can compare in seriousness with the dunes of Europe. A careful study of local conditions, especially of local shrubs and leguminous plants and grasses, to fix the zone nearest

the source of supply, and the planting of the proper kind of trees in the proper way in the inner zone will in most cases suffice to stop all serious shifting. In many places I believe shifting may be stopped by covering the surface with brush or hay and sowing amongst it seeds of native shrubs and trees.

In many places these dunes are looked upon as a picturesque feature of our coast, and until land is in greater demand in some districts than at present, they will probably be left in their natural condition, to be shifted here and there with every caprice of the wind.

FORESTRY AND IRRIGATION IN CONGRESS.

CALENDAR OF BILLS, RESOLUTIONS, AND OTHER MEASURES RELATING TO FORESTRY, IRRIGATION, AND DISPOSITION OF THE PUBLIC LANDS.

IN addition to the President's message, of which a résumé has already been given in this magazine, in so far as it concerned the subjects of forestry and irrigation and the administration of public lands, the following is a record of the Congressional acts relating to these interests during the present session, up to the holiday recess.

December 2.

Mr. Gibson introduced a bill (S. 6339) to confirm certain forest lieu selections made under the act approved June 4, 1897 (Thirtieth Statutes, 36). Referred to the Committee on Public Lands.

Resolution No. 340 (H. R.), submitted by Mr. Payne concerning the President's message: "That so much as relates to agriculture and appropriations therefor, and to forestry, be referred to the Committee on Agriculture;" "that so much as relates to the public domain be referred to the Committee on Public Lands;" "that so much as relates to the irrigation of arid lands be referred to the Committee on the Irrigation of Arid Lands."

Mr. Perkins introduced a bill (H. R. 15448) to repeal the duties on lumber and hides.

December 3.

Mr. Powers, of Massachusetts: A bill (H. R. 15509) to repeal the law providing for the sale of timber and stone lands, the desert land law, and the commutation provisions of the homestead law. Referred to the Committee on Public Lands.

Senator Quarles introduced a bill like the above in the Senate (S. 6363).

Senator Mitchell introduced a bill (S. 6401) for the relief of homestead entrymen upon the lands formerly included in the Siletz Indian Reservation in the State of Oregon.

December 5.

A letter from the Secretary of the Interior was received in the House of Representatives, submitting a report of the Director of the Geological Survey showing the work done under the law providing for the reclamation of arid lands. Referred to the Committee on Irrigation of Arid Lands.

Also a letter from the Secretary of the Interior, transmitting, with copies of the reports of the Commissioner of the General Land Office, estimates for the survey of the Walker River Reservation in Nevada, the Uintah Reserva-

tion in Utah, and the Spokane Reservation in Washington. Referred to the Committee on Public Lands.

Mr. Butler, of Pennsylvania, presented a petition from A. S. Haines and others, of Westtown School, Chester county, Pennsylvania, favoring the establishment of a national forest reserve in the Southern Appalachians. Referred to the Committee on Public Lands.

December 6.

Mr. Lacey called up from the Committee on Public Lands the bill (H. R. 11572) for the relief of certain settlers upon Wisconsin Central Railroad and the Dallas Military Road land grants. The bill was passed.

Mr. Lacey called up the bill (S. 3138) to set apart certain lands in the State of South Dakota as a public park, to be known as the Wind Cave National Park. The region is substantially what the Yellowstone country would be if the geysers should die. The active forces are no longer in operation there, but a series of very wonderful caves remain, and the Land Department has already withdrawn the tract from settlement. A portion of it is already in a forest reserve. The bill was passed.

December 8.

Mr. Lacey introduced a bill (H. R. 15764) to repeal the commutation provision of the homestead laws. Referred to the Committee on Public Lands. Also a bill (H. R. 15765) to repeal the desert land law. Referred to the same committee.

December 9.

A letter from the Secretary of the Treasury was submitted to the House, transmitting a copy of a communication from the Secretary of the Interior, submitting an estimate of appropriation for transcript of records and plats, General Land Office. Referred to the Committee on Appropriations.

Mr. Wiley introduced a bill (H. R. 15802) to authorize the register of the land office at Montgomery, Ala., to give certificates empowering certain persons to enter and take up public lands in certain contingencies, upon

surrender by such persons, by deeds of conveyance, of all claims against homestead entries made on lands to aid in the construction of the Mobile and Girard Railroad of Alabama. Referred to the Committee on Public Lands.

December 10.

Senator Gamble reported from the Committee on Public Lands, to whom it was referred, the bill (S. 6290) to extend the provisions of section 2455 of the Revised Statutes of the United States as amended by act of February 26, 1895, relating to public lands, without amendment and submitted a report thereon.

Senator Dubois introduced a bill (S. 6502) relating to ceded lands on the Fort Hall Indian Reservation. Referred to the Committee on Indian Affairs.

December 12.

Mr. Edwards introduced a bill (H. R. 15985) to confirm certain forest lieu selections made under the act approved June 4, 1897. Referred to the Committee on the Public Lands.

Mr. Tongue introduced a bill (H. R. 16022) for the relief of homestead entrymen upon the lands formerly included in the Siletz Indian Reservation, in the State of Oregon. Referred to the Committee on Indian Affairs.

December 15.

A bill (S. 6138) to set apart certain lands in the State of South Dakota as a public park, to be known as the Wind Cave National Park, having been enrolled and signed by the Speaker of the House, was signed by the President *pro tempore* of the Senate.

Senator Dubois, from the Committee on Indian Affairs, to whom was referred the bill (S. 6502), reported it with amendments and submitted a report thereon.

Mr. McRae introduced a bill (H. R. 16060) for the protection of the public forest reserves and national parks of the United States. Referred to the Committee on the Public Lands. Also a bill (H. R. 16062) to provide for the sale of the timber and other material growing or being on public forest reserves, and for renting or leasing of the lands thereon. Referred to the Committee on the Public Lands.

Mr. Dougherty introduced a bill (H. R. 16066) to amend an act entitled "An act to provide for the use of timber and stone for domestic and industrial purposes in the Indian Territory," approved June 6, 1900. Referred to the Committee on Indian Affairs.

Mr. Sparkman introduced a bill (H. R. 16069) authorizing the Secretary of the Interior to sell certain lands therein mentioned. Referred to the Committee on the Public Lands.

A resolution was presented to the House from the St. Louis Merchants' Exchange, favoring the removal of all restrictions upon the rights of alienation of all lands in the Indian Territory. Referred to the Committee on the Territories.

December 16.

Mr. Broussard brought up the bill (H. R. 15605) empowering and authorizing the Southwest Louisiana Rice Growers' Association to build a dam and locks in Bayou Vermilion, Louisiana. The bill was passed by the House. The dam in question is for rice irrigation.

Mr. Davey, of Louisiana, presented for unanimous consideration the bill (H. R. 15606) to authorize and empower the Rice Irrigation and Improvement Association of the State of Louisiana to construct dam and locks in the Mermen-tau River. The bill was passed by the House.

Senator Cockrell introduced a bill (S. 6626) to amend an act entitled "An act to provide for the use of timber and stone for domestic and industrial purposes in the Indian Territory," approved June 6, 1900. Referred to the Committee on Indian Affairs.

Mr. Glenn introduced a bill (H. R. 16156) relating to ceded lands on the Fort Hall Indian Reservation.

December 17.

Messages from the House of Representatives to the Senate announced that the House had passed the bills (H. R. 15605 and 15606) authorizing and empowering certain companies to make dams and locks to provide for rice irrigation.

Senator Gamble reported from committee the bill (H. R. 11572) for the relief of certain settlers upon Wisconsin Central Railroad and The Dalles Military Road land grants, without amendment, and submitted a report thereon.

Mr. Dougherty brought up the amendment to the timber and stone act, providing for use in Indian Territory for industrial and domestic purposes, which was passed by the House.

December 18.

A Senate bill (S. 6502) relating to the ceded lands on the Fort Hall Indian Reservation was referred to the Committee on the Public Lands.

Mr. Moody, of North Carolina, reported from the Committee on Agriculture the bill (S. 5228) for the purchase of a national forest reserve in the Southern Appalachian Mountains, with amendment, accompanied by a report (No. 2912). Referred to the Committee of the Whole House on the state of the Union.

December 19.

Mr. Stephens introduced a bill (H. R. 16280) to open for settlement 505,000 acres of land in the Kiowa, Comanche, and Apache Indian Reservations in Oklahoma Territory. Referred to the Committee on Indian Affairs.

Mr. Mondell introduced a bill (H. R. 16284) granting to railroads and water companies the right of way through public lands and reservations of the United States for reservoirs and pipe lines. Referred to the Committee on the Public Lands.

December 20.

The Secretary of the Interior transmitted to the Senate an agreement between the United States and the Arikara and other Indians of North Dakota, by which the Indians have ceded to the United States a certain portion of their reservation, and also the draft of a bill to ratify the agreement. Referred to the Committee on Indian Affairs.

The House announced to the Senate that it had passed the timber and stone act amendment (H. R. 16066).

Senator Perkins presented a petition from the Azusa-Covina-Glendora Fruit

Exchange of Azusa, of the Board of Trade of Whittier, of the Fruit Exchange of Covina, of the San Dimas Citrus Union of San Dimas, of the Covina Orange Growers' Association of Covina, and of the San Dimas Lemon Association of San Dimas, all in the State of California, praying for the enactment of legislation providing for a more efficient protection from fire of the forest reservations of southern California. Referred to the Committee on Forest Reservations and the Protection of Game.

Senator Warren introduced a bill (S. 6679) granting to railroads and water companies the right of way through public lands of the United States for reservoirs and pipe lines. Referred to the Committee on the Public Lands.

Senator Perkins introduced a bill (S. 6689) for the protection of wild animals, birds, and fish in the forest reserves of the United States. Referred to the Committee on Forest Reservations and the Protection of Game.

The bill (H. R. 16066) to amend the timber and stone act was referred to the Committee on the Public Lands.

The bill (H. R. 16069) authorizing the Secretary of the Interior to sell certain lands therein mentioned was reported without amendment, and, accompanied by a report (No. 2918), was referred to the Committee of the Whole House on the state of the Union.

Mr. Jones, of Washington, introduced a bill (H. R. 16310) for the opening of the remaining portion of the Colville Reservation, in the State of Washington, and for other purposes. Referred to the Committee on Indian Affairs.

STANDING COMMITTEES OF THE SENATE.

On Agriculture and Forestry.—Messrs. Proctor (chairman), Hansbrough, Warren, Foster of Washington, Dolliver, Quarles, Quay, Bate, Money, Heitfeld, and Simmons.

On Forest Reservations and the Protection of Game.—Messrs. Burton (chairman), Depew, Perkins, Clark of Wyoming, Pritchard, Kearns, Kittredge, Morgan, Tillman, Gibson, and Simmons.

On Irrigation and Reclamation of Arid Lands.—Messrs. Simon (chairman), Warren, Stewart, Quarles, Bard, Quay, Kearns, Dietrich, Harris, Heitfeld, Bailey, Patterson, and Gibson.

On Public Lands.—Messrs. Hansbrough (chairman), Nelson, Clark of Wyoming, Bard, Kearns, Gamble, Burton, Dietrich, Berry, McEnery, Heitfeld, McLaurin of Mississippi, and Gibson.

STANDING COMMITTEES OF THE HOUSE.

Agriculture.—Messrs. Wadsworth, Henry of Connecticut, Connell, Wright, Haugen, Dahle, Scott, Haskins, Henry C. Smith, Moody of North Carolina, Graff, Williams of Mississippi, Lamb, Cooney, Gordon, Allen of Kentucky, Neville, and Flynn.

Public Lands.—Messrs. Lacey, Eddy, Mondell, Miller, Jones of Washington, Esch, Moody of Oregon, Needham, Martin, Tompkins of New York, Fordney, Shafroth, Kleberg, Griffith, Brundage, Lassiter, Burnett, and Flynn.

Irrigation of Arid Lands.—Messrs. Jenkins, Ray of New York, Reeder, Mondell, Sutherland, Tirrell, Newlands, Neville, Underwood, and Bellamy.

FORESTRY IN NEW HAMPSHIRE.

AN ACCOUNT OF THE WORK DONE IN THE STATE, AS SHOWN IN THE FIRST ANNUAL REPORT OF THE SOCIETY FOR THE PROTECTION OF NEW HAMPSHIRE FORESTS.

AMONG the organizations which are doing active and valuable work in furthering the interests of forestry, the Society for the Protection of New Hampshire Forests is worthy of a prominent

place. This society has been in existence less than two years, but in this short time it has accomplished much of value to the State of New Hampshire and to the cause of forestry in general.

The record of its work appears in a first annual report, just issued, which contains recommendations to the New Hampshire legislature which would be valuable to the legislature of any one of the New England States. It contains also notes on the forest conditions of the state; a special article on the treatment of White Pine, considered the most valuable timber tree for New Hampshire; an article on the management of woodlots; a list of books on forestry, the text of the forest laws of New Hampshire and other states, and a list of the members of the society.

The Society for the Protection of New Hampshire Forests has taken for its motto the following words of President Roosevelt: "The preservation of our forests is an imperative business necessity. We have come to see clearly that whatever destroys the forest, except to make way for agriculture, threatens our well-being." The society recognizes and calls attention to the fact that the care and management of forests is one of the serious problems confronting the state, as three-fourths of its land area is unimproved or forest land. There are still left a few primeval forests of spruce and pine, the latter being very rare, while the former are found for the most part only on the highest mountain slopes. The great portion of the forest area is therefore cut-over land, either cut over lightly in the early logging days, leaving valuable timber now mature, or cut over in the severe modern way, by which the pine is taken down to 6 inches in diameter for staves and matches, and spruce to the same dimensions for pulp wood. Since 1850 1,764,609 acres of farm land have reverted to unimproved land, most of which is coming up to White Pine.

With these facts in view the objects of the society are: to encourage forest growth, to disseminate knowledge of planting, managing, and harvesting the forest crop; to establish a nursery for the distribution of seeds and seedling forest trees at cost; to establish a demonstration forest; to preserve scenic beauty in certain places where forest is an essential element; to apply to forests the principle of continuous yield and

thereby protect the future of the lumber industry and the persons depending thereon; and to urge the passage of forest laws based on best experience.

The society already has a good record for work done. Its first activity was in placing placards in prominent places calling attention to the need of forest preservation. The society employs a forester who gives his entire time and attention to investigations of timber growth and lumbering operations, advising upon woodlots, giving addresses at meetings with photographs and lantern slides showing New Hampshire forest conditions. The society has been represented at upwards of fifty meetings, of granges, farmers' institutes, women's clubs, teachers' meetings, agricultural and horticultural societies. Prizes have been offered in the high schools and academies of the state for the best essays on forest subjects, a wide correspondence on forest subjects has been maintained, and a membership throughout the United States has been secured. The society has had under advisement from its beginning plans for the establishment of a national park and forest reservation in the White Mountains.

The efforts of the society are not limited to the matter of forest preservation. On the contrary, it is even more interested in inculcating the belief that the forests are to be treated as sources of income, as with any other crop; to be made to grow in suitable situations where there are no trees now; to be harvested with reference to the future yield and the good of the growing crop.

Perhaps the most striking part of the whole report lies within the summary of the state by townships, with a reference to the forest conditions in each. Here is shown an intimate relation between forests and population, and that the "abandoned farms" of New England are in a great measure due to deforested and eroded hillsides. A direct quotation of a few of these summaries will give the best idea of what has been done in the way of forest destruction.

"Sharon.—A small town formerly well covered with farms, which, now that the forest has been cut off, are largely abandoned. Some twenty-five

of these have been bought up by a gentleman who lives in a neighboring town and who sells the woodlots on them to the Diamond Match Company. He finds holding these farms a profitable investment. It is said that the voters of the town number less than twenty-five, and that they find great difficulty in keeping up the roads and schools. It is estimated that two-thirds of Sharon's total valuation has gone with the cutting of the forests.

"*Richmond.*—This town has now been cut over, so that the fifty farmers who settled there shortly after the Civil War have moved away, and the town is becoming abandoned. There is little timber left that is fifty years old, but the

young growth is coming on and will yield a return to those who own the land in the future. If taken in charge, these lands can be made to yield far more than with nature's seeding. They should be properly planted with trees and later thinned, thereby producing much larger revenues."

Yet it must not be supposed that the New Hampshire task is hopeless. In many respects the people there have a most favorable basis on which to begin operations. The officers of the Society for the Protection of New Hampshire Forests are: Frank W. Rollins, President; Joseph T. Walker, Secretary; George T. Cruft, Treasurer, and Philip W. Ayres, Forester.

A SUCCESSFUL IRRIGATION COMPANY.

THE recently submitted annual report of President A. R. Well, of the Grand Valley (Colorado) Irrigation Company, for the fiscal year ending October 31, 1902, is of particular interest, inasmuch as it shows that the present organization is in a prosperous condition, and that it is founded on a healthy basis. The present company was organized in 1894, when a majority of the farmers of the region formed an association and bought from John P. Brockway all right, title, and interest to the existing system. The history of the irrigation companies of the Grand River Valley prior to this date is one of litigation, mismanagement, and financial disaster. At the last foreclosure sale ordered by the court, in 1892, a receiver was appointed and the ditch system became the property of Mr. Brockway, who, as stated, sold out in 1894 to the farmers of Grand River Valley for \$40,000 in 6 per cent 20-year bonds. The authorized capital of the new company was \$240,000, consisting of 48,000 shares of \$5 each, a share constituting $\frac{1}{8}$ inch of water right, the total water rights aggregating 15,000 inches. The company later issued \$20,000 betterment bonds.

That the present organization has been successful may be seen from the

following statistics. The running expenses and interest on bonded indebtedness are annually assessed pro rata against the stockholders. These assessments have been as follows during the years of the company's existence:

1894.....	\$0.96 per inch, or \$0.48 per acre		
1895.....	0.96	"	0.48
1896.....	2.24	"	1.12
1897.....	1.28	"	0.64
1898.....	1.60	"	0.80
1899.....	0.96	"	0.48
1900.....	0.96	"	0.48
1901.....	2.08	"	1.04
1902.....	2.08	"	1.04
1903.....	1.28	"	1.04
Average..	\$1.44	"	\$0.72

The 1896 assessment was unusually heavy, consisting in reality of \$1.28 spring assessment and \$0.96 fall assessment. Great damage was caused during the fall of that year by extraordinary floods, which did much harm throughout that section of Colorado. The expenditures for repairs from September 6 to October 31, as shown by the company's books, amounted alone to \$4,500, and the extra fall assessment was levied to meet this expenditure. During the following year \$34,000 were spent on the system, \$20,000 of which went to repairs for the damages caused

the preceding fall. Much remained to be done, however. The repairs made had been applied only where they had been most urgent, and the entire system was a patchwork from end to end. During 1898 and also in later years work was systematically continued, and, as stated in the report of President Well, the entire system is now in first-class condition. In 1901 large sums were expended on new structures. A new steel headgate was built at a cost of \$16,000 and \$1,000 additional spent on training works in the river. The books further show \$7,719 expended on new flumes. The main ditch was further enlarged, at a cost of \$6,000. To meet these expenditures, the annual assessments for 1901 and 1902 have been heavy, yet far from burdensome or excessive when it is considered that they include the interest on the bonded indebtedness. Mr. Well's report states that there was at the end of the last fiscal year a surplus in the treasury, no debts outstanding except the bonded debt, and that the condition of canal and structures never has been better.

If it is borne in mind that at the time this farmers' association was organized it had not one dollar in its treasury; that it owned a system in which hardly a structure was safe and the headgates

of which had been condemned as unsafe two years before; that it practically rebuilt the entire system in the course of six years, we may well look with gratification on the results achieved and congratulate the farmers of Grand Valley on the enterprise and energy they have shown.

Inquiry into the original cause of the financial difficulties experienced by former companies who operated the system at various times brings to light the interesting fact that the chief source of evil in their management was an annual assessment fixed by contract and fixed much too low to be profitable. Thus at the time the ditches in Grand Valley were consolidated under the management of the Travelers' Insurance Company, the fixed assessments levied were 40 cents per inch under the Grand Valley Canal; 20 cents per inch under the Mesa County Canal and Pioneer Extension; 35 cents per inch under the Independent Ranchmen's Ditch; average, 32 cents per inch, while it is estimated by competent authorities that the actual maintenance charges averaged \$1.25 per inch. It is hardly necessary to point out that great losses were inevitable, and that litigation with contractors and farmers was but the natural consequence of such shortsighted policy.

REFORESTATION IN MINNESOTA.

IN the General Laws of Minnesota passed in 1899, section 6 of chapter 214 is "An act to encourage the growing and preservation of forests, and to create forest boards and forest reserves and to appropriate money therefor." This act requires the Forestry Board to "make a report of its doings, conclusions, and recommendations to each session of the legislature," and in pursuance of this instruction the State Forestry Board has just submitted a report based particularly on the reforestation of what are known as the Pillsbury tracts, areas aggregating about 1,000 acres in Cass county, donated to the state by the late ex-Governor John S. Pillsbury, for forest pur-

poses. Under the provisions of the act, whose title is given above, the State Forestry Board is authorized to receive such donations of land, and this is the only gift of the kind which has come under the provisions of the law, and owing to the recent rise in the value of wild lands in Minnesota it is not likely that there will be any considerable further donation for some years.

Last June the tract was surveyed and a working plan made with a view of its reforestation. This plan was in charge of T. L. Duncan and four student assistants from St. Anthony Park Experiment Station. The tracts are mainly cut-over pine lands, favorably situated

for the reproduction of conifers if proper care is exercised; they are also accessible to transportation. The detailed plan for the operations on these lands was placed in the hands of Samuel B. Green, Professor of Horticulture and Forestry in the State University, and the plan he submitted met with the approval of the Board and was appended to the report to the legislature.

PLAN TO DEVELOP PILLSBURY FOREST RESERVE.

In substance the recommendations of Professor Green differed slightly from what they might have been had not this constituted the first work of the kind in the state, and was therefore to be approached in such a way that it would appeal as an object lesson to the people of the state, as well as to actually improve the tracts under consideration in the best possible way. Naturally, under this condition much of the new work would be experimental, but none the less valuable on that account.

In the first place the recommendations insist on a resident foreman to be assisted at such times as are necessary in seeding and planting; second, the establishment of fire lanes, preferably along the lines of waterways; third, to regenerate valuable species, using the present growth, Aspen, as nurses until the better varieties are firmly established; fourth, to establish local nurseries and thereby reduce the cost of seedlings and to grow only hardy trees inured to local conditions; fifth, to make a wise selection of trees to plant, using Norway and White Spruce for pulpwood as yielding the quickest financial returns; White Pine is also recommended, while the areas now in Norway Pine are to be so cared for that they will come into good stand at maturity; as an experiment Douglas Fir, Bull Pine, American and European Tamarack are to be planted with Soft Maple, Rock Elm, and Yellow Cottonwood in limited areas. The final recommendation is for the gathering of native seedlings for general planting on the Pillsbury tracts.

The estimate of expense for the work to be done seems slight when the value

that must accrue is taken into consideration. The investment which Professor Green would make is listed as follows:

House and barn for resident foreman.	\$1,400.00
Team and outfit, including wagon and tools.....	600.00
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Spruce seed, 300 lbs. at 90 c.....	270.00
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	\$3,584.50

ANNUAL EXPENSE.

Foreman's pay, 12 months at \$60...	\$720.00
Two men, 8 months' pay, each at \$40 per month.....	640.00
Extra help.....	400.00
Freight, express, and transportation.	100.00
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	\$1,860.00

Thus, to carry out this plan a permanent investment must be made from a first appropriation of \$3,584.50, to be available immediately, and an annual appropriation of \$1,860 for 1903 and 1904.

PURCHASE OF LANDS FOR FOREST PURPOSES.

The law of 1901 to set aside certain tax title lands for forest purposes actually set apart only such lands as were bid in under the law of 1893, so it is likely that only 1,000 acres of such lands will be secured by the Board. Thus it will be necessary for the state to get the title to waste lands by purchase. These non-agricultural lands it is shown amount to about 3,000,000 acres, and, while too hilly, sandy, or rocky for cultivation, can be made valuable with coniferous forests. These would insure the lumber industry of the state, and intelligently forested, would, in the course of time, greatly help to supply at least the home demand for lumber.

The Board points out that the State of Minnesota has been paying bounties amounting to \$20,000 annually for tree planting on its prairies, and it is only reasonable to suppose that the legisla-

ture will now appropriate sufficient funds to reforest once wooded regions. Four years ago an annual appropriation for the Forestry Board was started, of which \$898.93 has been expended to date and all bills are paid. No member of the board receives pay for his services. The members are: S. M. Owen, President; C. C. Andrews, Secretary; Samuel B. Green, Fred. Weyerhaeuser, John Cooper, O. M. Lord, B. Magoffin, M. M. Williams, and A. C. Wedge. They have drawn up and recommend for passage a bill entitled "An act to enable the Minnesota State Forestry Board to purchase land for forest purposes and to appropriate money therefor." The bill itself is as follows:

"SECTION 1. The Minnesota State Forestry Board is hereby authorized to acquire by purchase for the state, at not exceeding two dollars and fifty cents (\$2.50) per acre and preferably at the sources of rivers, any land in this state that is adapted for forestry, but not to exceed in any one congressional township one-eighth part of the area of such township, and to take such steps as are necessary to maintain forests thereon according to forestry principles. One-quarter part of the net forest revenue from such lands shall always be paid to the respective towns in which the lands are situated. No money shall be paid by the state for any such land until the Attorney General shall certify that the deed thereof conveys a clear title to the state.

"SEC. 2. To enable the Minnesota State Forestry Board to carry this act into effect, there is hereby annually appropriated out of any money in the Treasury not otherwise appropriated the sum of twenty thousand dollars (\$20,000). Any balance of such appropriation not expended in the year for which appropriated shall be available in any subsequent year if needed."

Governor Van Sant in his recent message to the legislature had the following to say regarding forestry:

"While our country excels in many branches of industry, it is outstripped by many other nations in the care and development of its forests. The value of the forests as actual wealth, their

usefulness in giving increased water supply, the great advantage in adding to the beauty of the landscape, and their health-giving qualities need not be argued, but only mentioned.

"Every one recognizes the great necessity of procuring forest areas in our state. The very fact that nature has been so bountiful seems to have encouraged wastefulness.

"Minnesota can justly claim great credit among her sister states for what she has done to preserve her forests and encourage development. Bounties have been given for nearly thirty years to encourage tree planting on the prairies, and nearly \$600,000 has been thus wisely expended. For eight years a system for the prevention of forest fires has been in operation, with excellent results. During this period, while disastrous forest fires have occurred in other states, Minnesota has wholly escaped.

"The establishment of a forest reserve of 200,000 acres on the Chippewa reservation is to be commended, and so should any measure which has for its object the creation of other parks and reserves.

"It is estimated that there are now about 30,000,000,000 feet of standing pine timber within the state, nearly all of which is in private hands, and which will be cut and marketed within the next fifteen years. After this time we will have to ship in our lumber from other states or countries unless we show a wise foresight and thus make our state independent of outside supply and save to our people a very important industry. There is a large amount of young and second-growth pine, a part of which will in twenty years, if preserved from fire, contribute to the lumber supply, and if proper steps are now taken our forest areas can be replenished and preserved so as to completely supply the people of our state with lumber.

"It would be wise for the legislature to authorize the forestry board to begin gradually to buy up, at a low price, tracts of non-agricultural land, and to plant the same with coniferous trees. I heartily commend any measure which looks to the protection of our forests, or which will aid in their development."

PUBLISHER'S NOTES.

The growing interest in forest by-products leads us to call attention to the advertisement of Mr. Mathieu appearing in this issue. Mr. Mathieu has accomplished a great deal in the utilization of what would otherwise be waste material. His devices can produce 45 to 50 bushels of charcoal from a cord of wood. Moreover, the charcoal produced even from slabs and waste material is of an excellent quality—solid, perfectly charred, and of the nature of lignite. Any one wishing to install a plant for the manufacture of forest products other than timber, such as wood alcohol, acetic acid, wood oil, turpentine, or charcoal, will do well to write to Mr. Mathieu for plans.

Even as far in advance of spring as the seed catalogues come, they carry with them the idea of outdoor growth. Particularly is this true of the new catalogue issued by J. M. Thorburn & Co., New York, which not only gives a complete list of seeds and plants for sale by that company, but presents also much information of value to horticulturists. Its illustrations are better than those usual in such publications, many of them being excellent half-tones from carefully prepared photographs. Altogether the publication is a dignified and complete one, well prepared and presented, and in keeping with the ideals of a firm which has been in existence long enough to have issued more than one hundred such annual catalogues. Those of our readers who are interested in gardening will do well to send to J. M. Thorburn & Co., 36 Cortland street, New York, for a copy of their 1903 catalogue.

Nurserymen everywhere are turning their attention more and more to the needs of foresters, and are making a specialty of forest-tree seeds and seedlings. Thomas Meehan & Sons, Dreshertown, Pennsylvania, after almost fifty years of progressive yet conservative development, are well known to be reliable in their announcements and in their dealings. A large part of their nursery is devoted exclusively to the propagation of forest trees, and they have issued a special catalogue from this department. They can be thoroughly relied on in their promises, for their assertions are based on long experience. The advertisement of this firm appears on another page of this number.

The publishers call attention to the announcement printed among the advertisements that 25 cents each will be paid for back numbers of the *Forester* and FORESTRY AND IRRIGATION of certain dates—*Forester* for July and December, 1901, and FORESTRY AND IRRIGATION for February and March, 1902.

Subscribers who wish their addresses changed should notify us promptly, giving the old as well as the new address. The publication date of FORESTRY AND IRRIGATION is the fifteenth of the current month, and any subscriber who has failed to receive the magazine within one week after this date should notify us immediately; otherwise we cannot always guarantee to supply missing numbers.

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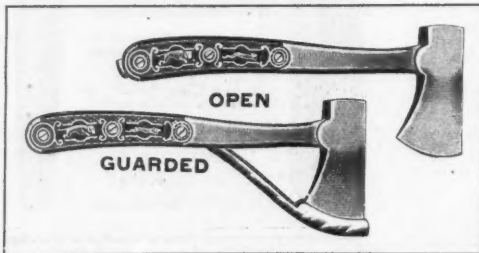
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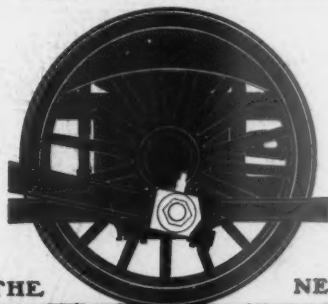
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